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SOCIOECONOMIC STATUS, WOMEN, AND HIV: DO THE DETERMINANTS
OF FEMALE HIV VARY BY SOCIOECONOMIC STATUS
IN CAMEROON?

by

Joyce Mumah

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Sociology

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Logan, Utah

2011

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ABSTRACT

Socioeconomic Status, Women, and HIV: Do the Determinants
of Female HIV Vary by Socioeconomic Status
in Cameroon?

by

Joyce N. Mumah, Doctor of Philosophy

Utah State University, 2011

Major Professor: Dr. Douglas Jackson-Smith
Department: Sociology, Social Work and Anthropology

The HIV/AIDS epidemic is argued to be one of the greatest health challenges facing Sub-Saharan African countries, with more than 25 million Africans currently infected. Social epidemiology posits that for most types of illness, there is an inverse relationship between indicators with SES. In most developed nations, and in some developing countries, the incidence of HIV follows this classic pattern, with the poor having the greatest risk of infection and eventual mortality. However, a growing body of research on HIV in Sub-Saharan Africa suggests an intriguing reversal of this pattern, particularly with respect to HIV among women. In the Cameroonian case most specifically, previous research indicates that higher socioeconomic status women present higher rates of HIV infection compared to low socioeconomic status women, albeit rates higher than those in the United States. However, the mechanisms of risk appear to be distinct for each group. Using data from the 2004 National Demographic and Health

Survey (DHS) in Cameroon, this paper explores relationships between the various indicators of socioeconomic status and HIV, as well as estimates and tests a series of multivariate models designed to highlight the distinct causal pathways that put higher SES women at increased risk of HIV.

In general, my results show that women with increased resources had higher rates of HIV, confirming results published elsewhere. Additionally, women with riskier sexual behaviors also presented higher rates of infection. Counterintuitively, however, women with increased knowledge of HIV, more domestic making authority, and access to health care all had higher rates of HIV infection.

Multivariate analysis revealed that the mechanisms of risk varied by socioeconomic status. For women in low socioeconomic group, what seemed to increase their risk was relative inequality (i.e. having a partner outside their socioeconomic bracket). Conversely, for women in the high socioeconomic group, their own sexual behavior seemed to account for their higher rates of HIV infection. What the results of this study indicated therefore was that the mechanisms of risk differed by SES and different approaches targeting each sub-group were needed to effectively combat the disease.

(236 pages)

PUBLIC ABSTRACT

Socioeconomic Status, Women, and HIV: Do the Determinants of Female HIV Vary by Socioeconomic Status in Cameroon?

The HIV/AIDS epidemic is currently one of the greatest health challenges being faced by many developing nations, especially countries of Sub-Saharan Africa. It is estimated that more than 25 million Sub-Saharan Africans are infected with the disease, with more than 2.8 million new infected cases in 2006. Mortality from the disease is high, with an estimated 2.1 million having already died from the disease. Women are more likely to be infected with the disease, and account for more than half of all global HIV/AIDS cases. Sub-Saharan African (SSA) women, specifically, constitute about 77 percent of all HIV/AIDS cases in the region. The incidence of the disease varies by region in SSA with the East and Southern regions having the highest infection rates (often exceeding forty percent of the adult population). By contrast, countries in the western region have rates that do not generally exceed ten percent. Within the western region, Cameroon provides an interesting case because it has a relatively high rate of HIV for this region, particularly among women.

Generally speaking, female vulnerability is a huge factor in the incidence and prevalence of the disease across the world and a woman's socioeconomic status (SES) frequently plays a substantial role in increasing her risk of being HIV positive, especially for women in the low socioeconomic categories. Previous research indicates, however, that in the Cameroon case, higher socioeconomic status women may be more susceptible to HIV, which contradicts traditional epidemiological theory. Based on this fact, this study tried to look at why women in the high socioeconomic status groups were more likely to be HIV positive despite having access to increased resources that should have limited their risk. More importantly, this study also sought to see if the factors that increased HIV risk for women in Cameroon varied by their socioeconomic status.

This study uses the Cameroon Demographic and Health Survey to explore the factors linked to HIV status among Cameroonian women in different SES classes. The results of the study show that factors or pathways that increase risk for low SES women do not follow the expected conventional patterns as they tend to have similar risk factors as the other SES groups. However, what seems to increase risk for low SES women in Cameroon was having a partner in a higher SES category. By contrast, though women in the higher SES group showed benefits of increased resources (such as access to health care, knowledge about HIV, and power in relationships), which should have protected them, the pathway of risk for this group failed to follow this expected pattern. What accounted for the higher rates of HIV among high SES women was their own sexual behaviors, especially longer years of premarital sexual intercourse.

In conclusion, though the SES-HIV relationship remains complex, the factors that increase or decrease HIV risk did vary by socioeconomic status. This study posits, therefore, that an effective HIV/AIDS policy must take into consideration differences in

risk factors across SES groups, and an effective policy must include a complimentary approach that targets women with more resources (which is not currently the case).

DEDICATION

To my mom and dad for their endless support, love, and encouragement.

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This work would not have been possible without the many people who gave their help and support throughout its completion. I must first and foremost thank the Lord Almighty for his love and strength that he gave throughout the course of my study at Utah State University. I am especially indebted to my major professor and mentor, Dr. Douglas Jackson-Smith, for providing me with the insight and valuable training I needed to complete this work. I have always said he was the last push I needed that convinced me to get into the PhD program and he certainly was the final push I needed to complete this program. I will forever remain grateful for your patience, kindness, and above all, for being the best mentor this graduate student would have ever dreamed of having. I also want to thank all of my committee members, Dr. Ron Munger, Dr. Amy Bailey, Dr. Christy Glass, and Dr. Eric Reither, for their willingness to help in all aspects of my dissertation. Dr. Eric Reither deserves special recognition for being the mentor I needed early on in my academic training which ultimately guided and directed me into this research path. Without that initial interest and encouragement, my academic research path would certainly have been different.

On a more personal note, the support of my family during this process cannot be stated enough. Whether they were listening to me complain or rejoicing when I made significant milestones, they were often the positive reinforcement I needed the most. For all of this I simply want to say, “I love you Mom, Dad, Maryphine, Larry, Vicky, Jenny, Dora, Noah Samuel, and Sam.” To my extended family in Logan: Bob and Barbara Bence, Dr. Brenda and Alvin Lailam, Drs. Christabel and Eric Tanifum, Marina Fosso,

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The time spent at USU will always have a special place in my heart. Through all the trials and successes I have had over the course of this program, the one thing that stayed constant was the department of Sociology, Social Work and Anthropology, due in part to the people within it. I will forever remain grateful and all I can say is “THANK YOU.” I am proud to have been an Aggie, and as they say “Once an Aggie, Always an Aggie.”

Joyce N. Mumah

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CHAPTER 1

INTRODUCTION

In the past few decades probably the greatest challenge that has faced and still faces Sub-Saharan Africa (SSA) is the Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) epidemic. One explanation of why the infection rates keep multiplying at high rates is because the region is very poor, with weak health systems, and prevention and care resources are inadequate to meet the crisis. Fauci (2008:289) puts it more succinctly when he says “the HIV/AIDS catastrophe has been one of the defining features of the past quarter of the century.” According to estimates from 2000, twenty-five million Africans were living with HIV infection representing 70 percent of the number of people living with HIV worldwide (Buvé, 2002). To reiterate the continuing pandemic nature of this disease, Msisha et al. (2008) note that in 2006 in SSA alone, there were about 2.8 million new HIV infection cases, with further 2.1 million deaths from AIDS corresponding to 72 percent of AIDS deaths worldwide.

The impact of this epidemic transcends all social and economic boundaries but a major reason why the impact of the HIV/AIDS epidemic is devastating to the SSA region is because this region is the home of seventy percent of the world’s poorest people. Of all regions, SSA has the lowest gross domestic product, with a majority of its population spending less than one U.S. dollar a day (Mbirimtengerenji, 2007).

Though the disease is widespread throughout SSA, there are large variations in HIV prevalence between the different regions in Sub-Saharan Africa. Studies show that countries in Eastern and Southern Africa have higher rates compared to those of the

Western and Central region of Africa. Some cities in Eastern and Southern Africa have prevalence rates that sometimes exceed forty percent, though the average rates in most cities in this part of the region is estimated at about twenty percent of the population. Conversely, except for large cities in Ivory Coast, large cities in Western and Central Africa are said to have prevalence rates that do not generally exceed ten percent (Buvé, 2002). Regional variation in the prevalence of HIV suggests that the epidemic might have started earlier in the Eastern and Southern region than the HIV epidemics in the West and Central Africa (Buvé, 2002).

Review of the literature in SSA demonstrates that the burden of the HIV/AIDS epidemic does not fall uniformly or similarly across society. Though it has been established as largely a disease of the developing world, the worst affected are women who are the poorest and most marginalized of all groups in the region. Globally women constitute more than half of all adults living with HIV, and 77 percent of all global HIV-positive women are living in SSA (MacLachan et al., 2009). Particularly in SSA, there is a positive relationship between being female and risk of HIV infection. It is estimated that there are about 14 infected women for every 10 infected men (UNAIDS, 2006), and young women are particularly more likely than young men to be HIV positive (Larkin, 2000; UNAIDS/WHO, 2006). According to MacLachan et al. (2009) no other region in the world displays such a strong association between gender and HIV.

Cameroon is no exception to the HIV/AIDS crises. Cameroon has one of the lower rates in Sub-Saharan Africa as a whole but one of the higher rates in West/Central Africa. The overall estimated number of people in Cameroon living with HIV/AIDS in 2004 was about 825,000 (ORC Macro, 2005), or roughly 5.5 percent of the total

population (estimated in 2007 at more than 18 million; World Factbook, 2009). The HIV/AIDS pattern in Cameroon mimics that of the other countries in Sub-Saharan Africa with females (especially young women) being disproportionately infected.

The prevalence rates of HIV in Cameroon have been on a steady increased since the early 1990s. Empirical evidence indicates that the HIV prevalence rate of pregnant women at antenatal clinics in the major urban areas of Cameroon, rose from 1.8 percent in 1992 to 7 percent in 2002 (UNAIDS & WHO, 2006). This is a stark number because in the 1980s and early 1990s the prevalence rate in Cameroon was low compared to those of its surrounding countries. Among young adults, the prevalence rate for women is over three times that of men aged 15-19 (2.2 women, 0.6 men) and 20- 24 (7.9 women, 2.5 men), and more than double for the age group 25-29 (10.3 women, 5.1 men). The only age group that has men surpassing women in HIV rates is the 35-39 age group (7.8 women, 8.6 men) (Adair, 2008). In all, the estimated prevalence among females is about 6.8 percent while that of men stands at about 4.1 percent (Nkuo-Akenji et al., 2007).

Female vulnerability to HIV/AIDS has been a major focus of attention in academic research, but an understanding of the pathways or factors that put them at risk is still not very clear. The specific patterns of HIV transmission, its incidence, and prevalence are ordered by both socioeconomic status (SES) and gender as well as other forms of social inequalities (Kathewara-Banda et al., 2005). Female vulnerability especially is compounded by the fact that there appears to be a strong association between low income, high unemployment and poor education, all of which are more common among women. A 2003 Human Rights Watch report concludes that “the reason AIDS has escalated into a pandemic is because inequality between women and men

continues to be pervasive and persistent” (2003:8). A large number of HIV researchers have identified gender inequality as a key variable that contributes to the high transmission rate of HIV and other sexually transmitted diseases among women (Booth, 2004; Dugassa, 2009; Gilbert and Walker, 2002; Katherwara-Banda et al., 2005; Sa and Larsen, 2008).

Pervasive gender inequality has also been linked to fundamental processes of national social and economic development. Sen (1999) argues that one of key routes to development is enhancing personal freedom. He notes that the process of development depends on expanding human capabilities by increasing the ability of citizens to live their fullest as well as their most creative lives. Within this argument is the assertion that “people are both the beneficiaries of such development and the agents of the progress and change that bring it about” (Human Development Report, 2004:127). In this regard therefore, for it to work, the process has to benefit everyone equitably with the participation of every member of society central to its success. Sen’s ‘capabilities approach’ identifies gender inequality as the most significant of these structural constraints on development and therefore argues that gender inequality undermines female freedom. Putting this in the context of HIV/AIDS, we realize that gender inequality limits women by affecting their ability to change or alter their or their partners’ behaviors. In turn, their susceptibility to HIV/AIDS undermines their ability to realize personal freedom and contribute to national development.

At the crux of this complicated relationship is an assumed interaction between poverty and gender which are thought to increase the vulnerability of women to HIV infection and the impacts of AIDS. While it is clear that gender inequalities contribute to

persistent poverty in SSA, the link between socioeconomic status and HIV risk is less clear. Research on the association between female risk and HIV infection are yet to produce definite results and are mixed at best. Much research has focused on the effects of socioeconomic status and associated material conditions, but findings appear contradictory and there is evidence that both high and low SES women in this region can have unusually high rates of HIV infection. In Cameroon, specifically, it appears that wealthy women have a higher risk of contracting HIV than poorer women, which flies in the face of conventional epidemiological wisdom that higher SES individuals tend do better on most measures of health (Reither and Mumah, 2009). There is also strong support for the role of cultural factors, particularly gender-based norms that structure attitudes and behaviors, and therefore influence the ability of females to control their exposure to HIV. A recent detailed review of the empirical literature suggests “a paradox in which both economic hardship and economic prosperity can result in increased risks of HIV for women” (MacLachan et al., 2009:363).

Research Problem

I believe that much of the inconsistency in previous research on patterns of HIV-infection among women in SSA is the result of a complex interaction between socioeconomic status and gender-based norms that influence sexual behavior. For poor women their weak economic position is said to affect their access to education, employment, knowledge about HIV, and health services, as well as limit their ability to negotiate safer sexual behaviors within their relationships. In contrast, for high SES women their strong economic position offers greater access to information and services,

and should provide them with greater power to influence decisions regarding sexual behavior within their relationships. The benefits of improved economic status, however, appear to be mitigated somewhat by distinctive sociocultural norms for sexual behaviors among high SES men and women. In particular, high SES women tend to delay marriage and have more extensive sexual experiences prior to marriage. In addition, their high SES male partners are more likely to have multiple concurrent partners which can increase the exposure of high SES women to HIV infection.

Following the above statements, this study aims to address the following research questions:

- 1) **Why are the benefits of better economic status not impacting the risk of HIV for high SES women?**
- 2) **Do the mechanisms that put women at increased risk of HIV in Cameroon differ by SES?** Specifically, this study will look at the following sub questions:
 - a. **How does SES affect the ability of women to avoid behaviors that expose them to HIV risk?**
 - b. **How does SES influence access to knowledge, health care cultural norms, and power within relationships that influence behaviors that increase women's risk of HIV?**

Taking into consideration that the results from research on the HIV/AIDS and the interaction with female susceptibility and SES has provided mixed results, a study on the pathways that seem to put women at risk is necessary. We can infer from the literature that these pathways will differ by SES; however, exactly how these pathways differ is of special concern. The mere fact that women of both high and low SES can be at high risk of contracting HIV is intriguing and worth pursuing in these study. It is my belief that if the distinct mechanisms that seem to put women of different socioeconomic groups at

risk of HIV are identified, more effective and targeted policy interventions may be possible, in contrast to the “one size fit all” policy we often see now. Moreover, because relatively few studies on women and HIV have been conducted in West Africa, this study will provide important insights into the ways in which social, economic and cultural factors interact in this part of SSA.

The following chapter reviews the empirical and theoretical literatures on HIV/AIDS which provide a framework for understanding the complex relationship between SES, gender, and HIV. Chapter 3 describes the data and analytical methods used in this dissertation. Chapters 4 and 5, respectively, present the results of bivariate and multivariate statistical analyses that examine the research questions. Chapter 6 summarizes the key findings, and explores the implications of the findings for the academic research literature on gender and HIV, as well as for the development of better HIV prevention programs and policies in Africa.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

Female vulnerability to HIV has been a major focus of academic research but the conclusions from different studies have been contradictory and a clear picture of the underlying forces at work remains elusive. Nevertheless, most researchers agree that gender is a key to understanding and addressing the global HIV/AIDS epidemic especially in the region of Sub-Saharan Africa (Clark, 2004; Dugassa, 2009; Ehrhardt et al., 2009; Esu-Williams, 2000; Greig et al., 2008; Johnson and Way, 2006; Molla, Berhane, and Lindtjørn, 2008; Reither and Mumah, 2009). This literature review will identify some of the major socioeconomic and cultural factors that explain why HIV is a significant problem in Sub-Saharan Africa. I aim to show that the complex relationship between gender, SES, and HIV is critical to explaining and addressing the increased risk of HIV experienced by women in Sub-Saharan Africa.

Determinants of HIV/AIDS Vulnerability

Data suggest that many factors increase individuals' risk of contracting HIV in Sub-Saharan Africa. These factors operate both at the individual and aggregate levels and include but are not limited to social, economic, and biological factors.

Socioeconomic Status and Health

Broadly speaking, an inverse relationship between socioeconomic status (SES) and health is one of the most consistent finding in social epidemiology. Researchers argue that the lower the SES, the higher the frequency and occurrence of most health problems, disease and death (Adler and Newman, 2002; Lynch and Kaplan, 2000; Mishra et al., 2007a; Mulatu and Schooler, 2002; Williams and Collins, 1995). Conversely, wealthier populations do better on most measures of health status, including nutrition, morbidity and mortality, and healthcare utilization. This relationship can be seen not only in developed countries but also in developing countries and this inverse relationship can be seen whether measured at the individual or aggregate level. Usually the relationship between SES and health is such that an improvement in health status is seen with every increase in SES with this relationship being termed a gradient (Marmot et al., 1999). The important components of SES are income, education and occupation, and globally there is a strong inverse relationship between HIV infection rates and all three components. It is no surprise therefore that researchers like Gilbert and Walker suggest that “for 1/4th of the world’s population absolute poverty remains the principal determinant of their health status, exposure to HIV/AIDS, and high levels of fertility” (2002:1093).

Several mechanisms have been put forth to explain why low SES is usually associated with poor health outcomes. The mechanisms that underlie SES differences in health are broad and include but are not limited to factors such as access to medical care, health practices, stress, and work environments (Williams and Collins, 1995).

Access to medical care (especially the inadequate use of preventative medical care) is said to be different in terms of quality and quantity by economic groups in

society. Access as well as the usage of medical care is considered an important determinant of health status. The higher rates of incidence and disease mortality among the poorer are indicative sometimes of later initial diagnosis of disease, delays in treatment, or gaps in the quality of the care they receive (Adler and Newman, 2002; Williams and Collins, 1995). In the same light, health behaviors are also important determinants of health. In developed countries it is often reported that unhealthy life styles account for half the annual number of deaths (Williams and Collins, 1995). In developing countries unhealthy lifestyles sometimes driven by poverty often lead to malnutrition that severely undermines the health of the poor, diminishes their quality of life, and ultimately leads to increased mortality rates (Mulatu and Schooler, 2002).

Exposure to psychological stress is said to be particularly high among lower SES individuals as evidenced from both cross-sectional and longitudinal studies in developed countries, with the explanation being that they tend to have higher levels of anxiety, depression, or hopelessness (Adler and Newman, 2002; Mulatu and Schooler, 2002). Though stress is experienced by individuals in all walks of life, lower SES persons live and work in more stressful environments (Adler and Newman, 2002). An obvious way in which SES may affect health is differences in occupational conditions. Studies have clearly shown jobs with strenuous conditions or no support, or jobs that involve repetition are associated with increased risks of health problems including individuals most often than not rating their health as worse (Mulatu and Schooler, 2002).

SES and HIV

Consistent with this epidemiologic literature is the finding in most developed countries that there is generally an inverse association between SES and the likelihood of HIV infection. Okigbo et al. (2002:631) note that “socioeconomic status is an important factor in the incidence of HIV/AIDS, as it is widely accepted that lower socioeconomic status makes a group more susceptible to various health problems, including HIV/AIDS.” There is therefore greater incidence of HIV among the poorer segments of the population in developed nations. In the United States, for example, there is evidence of greater incidence of HIV/AIDS among African Americans and Hispanics who incidentally constitute the poorer segments of the population. Moreover, even when relevant AIDS education is presented, their poor economic condition sometimes places serious obstacles such that proper behavior regarding safe sex is unlikely (Okigbo et al., 2002). In general, there is evidence of an inverse relationship between socioeconomic status and the risk of most sexually transmitted infections (Mishra et al., 2007a).

At the global and regional levels, low SES countries/regions seem to have the higher HIV rates with the poorest regions having the highest rates of HIV infection and mortality from AIDS. A good example is Sub-Saharan Africa, which has the lowest gross domestic product (GDP), with more than sixty percent of the population spending less than one US dollar a day, and the highest HIV rates in the world (Mbirimtengerenji, 2007; Whiteside, 2002).

Evidence for a Traditional Inverse HIV-SES Relationship in SSA

Within SSA, however, the associations between SES and HIV have been more complex. The poorest countries in the region do not always report the highest HIV rates. For example, African nations such as Botswana and South Africa have the highest rates but they are also among the wealthiest countries in the continent. Moreover evidence for a direct association between SES and HIV infection at the individual, household and community levels have not been as clear as those found in the United States and other developed nations. In a recent review of thirty-five studies on SES and HIV status from several nations in SSA, thirty of which were cross-sectional studies and five cohort studies, Wojcicki (2005) noted that seven of the cross-sectional studies found a negative association between household SES and HIV infection, while ten described a positive association. Twelve of these studies found no association between SES and HIV infection while one study found a mixed effect by marital status. Of the five cohort studies, three found no association between high SES and HIV infection, one found a positive association and one found a negative association.

There have been very few community level studies in SSA on the association between local SES and HIV risk, and the results from these studies on community wealth and HIV infection present a complex picture. High HIV mortality rates in many SSA communities appears to be directly related to minimal access to basic amenities such food and water, which can increase malnutrition and susceptibility to disease, but may also reflect the indirect effects of differential access to antiretroviral drugs that are used to treat HIV-infected patients. Poorer communities have limited access to information that could potentially reduce transmission rates and have inadequate services in form of health

care providers or facilities. Because the nearest centers are far away and with limited transportation means, many in poorer rural communities will chose not to sacrifice the time to seek medical care, especially if it will take them away from the agricultural activities that are their main source of income (Ngwakongnwi and Quan, 2009).

At the individual level the association between SES and HIV is even more complex. Many studies have documented an inverse relationship between SES and HIV among certain populations in Sub-Saharan Africa, where the poorer segments of the population appear to be at increased risk than the wealthier individuals. Subsequently some argue that information, education, and counseling activities do reach the poor but given the reality of their lives these messages are not necessarily relevant and operable (Booyesen and Summerton, 2002; Mbirimtengerenji, 2007). In this light, Mbirimtengerenji (2007) contends that the poor do understand what is being demanded of them, however, they more often than not lack the motivation or the means to adopt the recommended behaviors. In a study in the *Lancet*, Fenton (2004:1186) argued that “...poverty plays a role in creating an environment in which individuals are particularly susceptible and vulnerable to HIV/AIDS...” concluding that poverty is the main reason individuals seem to be at an increased risk of HIV/AIDS.

SES is a multi-dimensional concept that goes beyond mere income or wealth, and frequently is studied using indicators of education and occupation. Some have argued that education is the most basic SES factor since future occupational opportunities and prospective earnings seem to be dependent on it. Within SSA the associations between education and HIV/AIDS indicate that HIV prevalence tends to be lower among individuals with secondary education, with the difference being greater in women. Many

have argued that young men and women in the higher wealth group are more likely to be educated and to have an educated person for a partner, however such men are less likely to have partners who were HIV positive (Lopman et al., 2007). Supporting this assertion have been studies done in Tanzania, South Africa, Cote d'Ivoire, Cameroon and Uganda. These studies have either found no marked association between increasing education and HIV seroprevalence for both men and women or have found that each additional year of schooling lowered the risk of being HIV positive. The main conclusion from these studies is that education appears to provide a protective effect from risk of HIV infection (Bärnighausen et al., 2007; Gillespie, Kadiyala, and Greener, 2007; Glynn et al., 2004; Lopman et al., 2007; Msisha et al., 2008).

Occupational status is a more complex aspect of SES partly because its measurement varies “depending on one’s theoretical perspective about the significance of various aspects of work life” (Adler and Newman, 2002:64). In the case of the HIV/AIDS epidemic, different studies have found associations between occupational status and health outcomes. Women with lower socioeconomic status are more likely to have occupations that expose them to increased chances of contracting HIV (Dunkle et al., 2004). Within Sub-Saharan Africa individuals with low income jobs such as waitressing, barmaids, and prostitutes/commercial sex workers have been shown to be at increased HIV risk due to the likelihood of coming in contact with those who travel (Wojcicki, 2005). Africans with occupations that require travel such as truck drivers and driver’s assistant, those in the army, and migrant workers have been shown to have much higher rates of HIV infection (Mosoko et al., 2009; Wojcicki, 2005).

Mobility and migration are also demographic trends that can affect HIV status, and migration patterns are often linked to SES. Many regions in Sub-Saharan Africa have been heavily impacted by wars, famine and deteriorating economic conditions, which has forced the displacement of individuals, families, and communities. Some regions in Sub-Saharan Africa have experienced mass relocation of people to other regions within or across national borders. There are people running from civil wars in Sudan, Mozambique, Angola, and Congo. Migration also has been dubbed “a flight from poverty” (Mbirimtengerenji, 2007). With local jobs scarce, people in SSA are often forced to migrate to other regions or countries in order to survive.

In some of the cases population movement is associated with exploitation and disruption which contributes to the spread of the HIV infection (Mbirimtengerenji, 2007). One consequence of such mass population displacements is increased commercial sex work by some as a means of survival (Cohen, 1997; Mbirimtengerenji, 2007). Deteriorating economic conditions have also forced family separation in many Sub-Saharan countries, which has been linked to greater frequency of sexual relationships outside of marriage. Men forced to migrate for mining jobs frequently replace their rural wives with urban women (Mbirimtengerenji, 2007).

Short-term residence in a region, major transportation routes, immigrant status, and international travel have all been linked with higher prevalence of HIV in the SSA (Brockhoff, 1999; Mbirimtengerenji, 2007). This link can be seen in the southern region of Africa especially as large scale migration motivated by economic reasons is a regular occurrence. Because of the gold, platinum and diamond mines in South Africa, there has been a lot of migration of men from Lesotho, Swaziland, Malawi, Zimbabwe,

and Zambia in search of jobs. Because workers live in barracks and hostels, men have the tendency to spend their spare time drinking and seeking female companionship and sex (Mbirimtengerenji, 2007).

This movement has brought infections from other parts of the region to “destination countries like South Africa and again back to their countries of origin” (Mbirimtengerenji, 2007:614). In Malawi for example, it is estimated that the HIV/AIDS prevalence among Malawian migrants to South Africa increased from 3.8 percent to 29 percent between 1986 and 1989 (Mbirimtengerenji, 2007).

The situation is further worsened by the fact that in several countries, when these members who had been living and working in towns and cities or abroad get sick, they are most likely to return to their local community, which consequently increases the rate of the HIV/AIDS epidemic in the rural areas. Consequences of these migrants being sick is quite devastating to the rural communities who now bear the brunt particularly through the loss of remittance income by the worker who is now sick, as well as through the cost of supporting this family member on their return home once they are ill (Mbirimtengerenji, 2007).

Evidence for a Positive HIV-SES Relationship in SSA

As we noted at the beginning of the last section the patterns between SES and HIV are complex. Okigbo et al. (2002:631) noted that “because higher socioeconomic status often correlates with higher education, better knowledge of health and public affairs, and greater access to public facilities, people who are at the lower end of the social scales often get trapped in vicious circles of ignorance, poverty, and inaction”

which is consistent with traditional inverse SES-health relationships. However, a significant number of studies in SSA suggest that, under some conditions, HIV may be more common among high SES individuals.

In particular, several recent studies in SSA report that wealthier individuals can be at increased risk of HIV infection (Johnson and Way, 2006; Mishra et al., 2007a; Msisha et al., 2008; Muthengi, 2009). Adair (2008) found that women living in a household in the middle, richer and richest categories were far more likely to be HIV-positive than women in the poorest wealth category in Cameroon. Studies also show that within African communities, European influences and urban life have been associated with HIV risk (Wojcicki, 2005). It is argued that wealth tends to be associated with various HIV-infection risk factors, such as low rate of condom use or no condom usage at all. This nonchalant behavior towards HIV by the wealthy is captured by Wojcicki (2005) who notes that AIDS has been described by some using slang terminology “Acquired *Income* Deficiency Syndrome.” Other studies have shown that adults in the wealthiest quintile had a higher prevalence of HIV than those in the poorer quintiles in Sub-Saharan Africa (Mishra et al., 2007a). A positive relationship between wealth and HIV was also found among cohabiting couples in which increases in wealth were associated with greater likelihood that one or both partners were HIV infected (Mishra et al., 2007a; Msisha et al., 2008).

Theories for why SES and HIV might be positively related point to different mechanisms than traditional SES/health models. Of primary interest are patterns of sexual behavior linked to an individual’s wealth. The majority of most HIV infections worldwide have been attributed to heterosexual sexual transmission (UNAIDS, 2006).

Several studies have shown that in SSA, level of education and income increases the probability individuals will have non-regular sexual partners, which is known to also increase exposure to STDs including HIV (Kongnyuy et al., 2006; Mishra et al., 2007b). In many countries, men with higher incomes and greater access to resources are more likely to have greater number of female sexual partners, and are less likely to be faithful within their marriages, which also increase the risk of HIV infection (Mishra et al., 2007b).

As noted above, knowledge and life skills associated with formal education are normally believed to provide better educated persons with greater access to information and resources and to promote healthier behaviors than individuals with little or no education (Adler and Newman, 2002). However, as in the case with wealth, some studies have documented positive associations between higher education and increased risk of HIV especially in some countries in Eastern and Southern Africa (Glynn et al., 2001; Hargreaves and Glynn, 2002; Johnson and Way, 2006; Reither and Mumah, 2009). These studies suggest that those with basic primary education had twice the odds of being HIV-positive as those with no education and there were no significant differences between those with secondary and higher education and those with no education, as both had similar odds of being HIV positive (Johnson and Way, 2006). In Reither and Mumah (2009) we found that HIV infection rates increased with level of educational attainment for women in Cameroon. What appears to be the case is that groups with access to basic primary education may be exposed to risk factors for HIV exposure that populations without access to education do not share. Interestingly, studies that find a positive association between wealth and HIV often do not find the same pattern with education,

suggesting that SES-HIV linkages are complex (Glynn et al., 2004; Hargreaves and Glynn, 2002; Msisha et al., 2008).

Another explanation given for the positive associations seen between higher wealth, education and increased risk of HIV is that education and wealth are linked to occupational status, particularly with better jobs that offer increased mobility or access to potential sexual partners. Men and women with higher incomes are argued to be more likely to travel and thus have more opportunities for casual sexual contacts (Mishra et al., 2007b). In two recent studies, African men and women who had travelled to central Africa, Europe or North America were at increased risk of being HIV-infected as they were more likely to engage in high-risk behaviors (Mishra et al., 2007b; Wojcicki, 2005). In contrast, other studies have found that African men who traveled were no more or no less likely to be HIV-positive than those who did not travel nor did mobility affect the relationship between SES and HIV status (Johnson and Way, 2006; Seeley et al., 1994).

With regards to occupation, the influence of occupational status may be mediated by gender. In one study, women in professional jobs reported the highest incidence of HIV-infection, but for men it was the unemployed who were most likely to be HIV-positive (Msisha et al., 2008). It is argued that the mechanism that put professional women at increased risk may be that they are married to or have sexual relationships with wealthy men, who's promiscuous behavior then places them at increased risk of HIV infection (Msisha et al., 2008). In fact, Msamanga et al. (2006) found that the increased prevalence of HIV infection among women who reported having their own source of income might be explained by their associations with professional men who also showed high prevalence rates.

At the community level, some positive associations have been observed between community SES and HIV infection. There is evidence that neighborhood SES is an important determinant of HIV, especially among young women (Gabrysch et al., 2008). This study found that not only were girls in lower SES neighborhoods more likely to be HIV positive, but girls in the middle SES neighborhood also had an increased HIV prevalence. Proximity to a market (which is more common in higher SES areas) seems to substantially increase the risk of HIV infection for women. Other community based studies indicate that HIV prevalence in urban areas is about twice as high as in rural areas (Bärnighausen et al., 2007; Gabrysch et al., 2008).

Women and HIV

Because women are disproportionately affected by the disease, researchers have posited that a clear understanding of the HIV/AIDS epidemic within Sub-Saharan Africa requires an understanding of gender and the role it plays in the vulnerability of individuals to the disease. Before delving into the main points, a clear distinction between sex and gender is needed. “Whereas sex describes a biological distinction between men and women, gender is a social construct that differentiates the power, roles, responsibilities, and obligations of women from that of men in society. People are born female or male but learn to be girls and boys who grow into women and men. It is this learned behavior that makes up gender identity and determines gender roles” (Türmen, 2003:411).

Sex

When we talk about sex there are certain physiological characteristics that innately put certain individuals at increased risk of HIV infection. From a biological point of view, women are said to be more susceptible to HIV infection than men. In general, during sexual intercourse the partner at highest risk is the receptive partner which means that women have a higher risk of becoming infected during intercourse than men (Türmen, 2003). Türmen (2003) estimated that in terms of transmission routes, male-to-female transmission of HIV is two to four times, than female-to-male transmission. Young women are especially vulnerable to HIV infection through sexual intercourse because “the immature genital tract of girls is more likely to sustain tears during sexual activity, creating a higher risk of HIV transmission” (Türmen, 2003:412). Conversely, when it comes to men, studies indicate that circumcision has a protective effect (Buvé, 2002; Hargreaves et al., 2002; Meier et al., 2006). Johnson and Way (2006) estimate that uncircumcised men are four times more likely to be HIV-positive than circumcised men.

Gender

Societies are divided along gender lines and cultural ideas about the roles of men and women can have considerable effects on health behaviors and outcomes (Gilbert and Walker, 2002). Socio-cultural norms dictate how women are expected to behave and adherence to these norms can have direct impacts on their health and well being. In the case of SSA, power is overwhelmingly in favor of men with this power imbalance having more negative consequences for women than men. Whereas “gender refers to sets of social expectations and ideas about the appropriate behaviors of men and women, gender

differences are fundamentally underpinned by power inequalities, which result in a subordination of women and their interest in a gender order that privileges men and is organized by male power” (Grieg et al., 2008:S36). It is perhaps true that the power commanded by both individual men and women is often shaped by an array of other life experiences which includes access to economic resources, education, age, race and geographical location, but at the end it is difficult to deny that there is a gendered distribution of power which ultimately privileges men (Grieg et al., 2008).

The relation between HIV and the gender is mediated through these power relationships that are expressed at both the individual and societal level. There are many social and cultural conditions that create gender inequalities which put women at risk of transmission or increase their vulnerability to HIV infection (Dugassa, 2009).

Perhaps the most obvious level to start with is the relationship level. HIV transmission in SSA occurs mainly through heterosexual contact which means that dating, marriage, and sexual behaviors are critical links in determining HIV risk. Because increasing numbers of young men and women begin sexual activity before marriage, relationship patterns among young adults (e.g., the number and frequency of sexual partners) can be an important risk factor for HIV-infection (UNAIDS, 2004b; Izugbara and Modo, 2007). Moreover, there appear to be important gendered differences in pre-marital sexual behavior. Harrison, Cleland, and Frohlich (2008) found that young men were more likely to have multiple and concurrent partnerships, whereas for young women if they had multiple relationships, there were more likely to be sequential relationships, with any overlap most likely happening in the context of a partner change at the start of a new relationship. Certain partnering practices, such as young women’s

partnerships with older men, have been shown to increase substantially women's risk of acquiring HIV (Harrison et al., 2008; Pettifor et al., 2005; Sa and Larsen, 2008).

Marriage

Marriage in all societies is an important step in a person's life course. Most African women live in a world where their worth is measured by marriage, children, and how the care for their family. Generally speaking marriage is associated with economic security and stability and this suggests that marriage can provide a protective effect against female vulnerability to HIV infection (Shisana et al., 2004). This is supported by evidence that divorced/single and widowed African women have higher risks of HIV infections than married women (Wojcicki, 2005)

However, the literature on marriage and its association with HIV show that though marriage seems to have a protective effect; it is mediated by gender (Boileau et al., 2009; Shisana et al., 2004). For example Shisana et al. (2004) found that married women were significantly less at risk of HIV infection than unmarried women. However, the risk did not differ between married and unmarried men, probably because sexual behaviors (notably infidelity) were the same for both groups. They argue that this relationship is mediated by SES, in which there is a lower HIV prevalence among poor married people than poor unmarried people on one hand, yet a higher HIV prevalence among the wealthy married people than wealthy unmarried people.

Conversely, some researchers have identified mechanisms through which marriage can actually increase the risk of HIV infection. In their study of urban residents in Rwanda and Zambia, Dunkle et al. (2008) contend that most of the heterosexual HIV

infections in both men and women were likely transmitted between married partners.

Further, they argue women are more likely than men to have entered the marriage already infected, because women are generally infected at younger ages than men, and are thus more likely to infect their husbands (than vice versa). Married men in their study who were infected by their wives then went on to infect other younger unmarried women. Meanwhile, Glynn et al. (2003) found that the number of HIV-positive persons with HIV-positive spouses was similar for men and women in Kenya and Zambia. They argue, therefore, that given “the higher prevalence of HIV infection among women than men before marriage, combined with the probable higher rate of male-to-female than female-to-male transmission within marriage,” men were most likely to have contracted HIV infection from outside of the marriage, and women from before the marriage. These conclusions were supported by studies in Ethiopia, Zimbabwe, and South Africa which found that both married and never-married young males engage in risky sexual behavior, with men reporting higher number of life time partners than women, as well as less consistent condom use with their concurrent regular and non-regular partners (Genberg et al., 2008; Molla et al., 2008).

Timing of marriage seems to affect the risk of HIV in Sub-Saharan Africa.

Bongaarts (2007) found that later age at marriage is associated with higher risk of HIV at both the individual and country-levels in various African countries. He argued that it is not late marriage itself that puts women at risk but the time interval between first sexual intercourse and age at marriage that puts these women at increase risk. With this time interval being long, women will more likely have more sexual partners and a long period of premarital sex. In Cameroon, marriage at age of twenty and above among women had

two-and-a-half times the probability of being HIV-positive than women marrying at age 16 and below (Adair, 2008). Risk of HIV infection associated with late marrying women in Cameroon was explained to some extent by their larger number of partners, which is linked to longer periods of premarital sexual activity (Adair, 2008).

An opposing view argues that early marriages can put young women at increased risk. Researchers have found that adolescent women who enter early marriages have less negotiating power, will have sexual intercourse more frequently, most probably marry men who are older and HIV-positive, and to experience greater pressure to bear children, which are factors known to increase the risk of unprotected sexual intercourse in SSA (Clark, 2004). Large age gaps between men and their spouses are also a known risk factor for women who marry, but not for men (Hargreaves et al., 2002). Pressure to bear children may increase sexual activity and HIV exposure since studies have shown an association between having problems conceiving and HIV infection (Sa and Larsen, 2008). The main contention here is that traditionally, childbearing is an important rite of passage for women in SSA which is a necessity in order to acquire and maintain economic security and social status within the family and kin. Failure or inability to have children is likely to increase the probability that both men and women will seek extramarital partners.

Sex is regarded as part of the package that comes with marriage and therefore regarded as an obligation on the part of wives. Kathewara-Banda et al. (2005:658) contend that many women in SSA believe that their husbands “have a right to demand sex, or they have low expectations of their right to control the terms of their sexual interactions.” In these cases marital rape occurs partially as a result of pre-existing gender

relations between men and women which dictate women's subordinate status within the family (citing Human Rights Watch, 2005).

In some studies, being in a polygamous marriage increases risk of HIV infection. Johnson and Way (2008) show that women who were one of three wives in a polygamous marriage were over three times more likely to be HIV-positive than women who were the only wife in a marital or cohabiting union.

Culture, Gender and Sexual Behavior

It is not necessarily the process of marriage itself that put individuals at risk, but the cultural attitudes that affect sexual behaviors before marriage, within a marriage, or after the dissolution of a marriage. Most of these attitudinal factors are supported by cultural norms which reflect the interplay between socio-economic status and cultural expectations for both women and men. The complex relation marriage seems to have with HIV is also because of the cultural socialization of both men and women in Sub-Saharan Africa. Traditional norms in the region require that women have less power sexually within their respective unions. On the other hand, these social and cultural norms permit men to engage in sex with multiple partners, with much younger partners, and to dominate decision making during sexual encounters (Esu-Williams, 2000; Gillespie et al., 2007; Smith, 2007). This power imbalance in specifically heterosexual relationships is argued to also contribute to a "culture of silence that surrounds women's sexuality" (Gupta, 2002).

Notions of masculinity in the Sub-Saharan region require men to be risk takers sexually thereby encouraging them to put their health as well as that of their partners in

jeopardy (Grieg et al., 2008). Traditional norms in SSA expect successful men to have many sexual partners which increase the risk that they will have intercourse with people who are HIV positive. For men a major manifestation of masculinity is their ability to have multiple partners (Caldwell, 2000). Kistner (2003:42) contends that “having multiple partners is a status symbol, the yardstick by which masculinity, intelligence, and success is measured among one’s male friends.” For example in countries such as Zimbabwe and South Africa the estimated HIV prevalence of about 20 percent is attributed to male’s lack of condom use, be it with their concurrent regular and non-regular partnerships, which subsequently increases the risk of HIV transmission and acquisition among females within their respective heterosexual partnerships (Genberg et al., 2008). In addition, traditional male attitudes in SSA may include a belief that seeking out health services is a sign of weakness, and thus many men underutilize available resources. When men don’t have access to or fail to use health services, they put the health of their sexual partners at risk (Peacock et al., 2009).

Peacock et al. (2009) contend that the societal norms which confer privileges on men also harm the health of women. These norms and values enforced by culture is very much manifested by the acceptance and encouragement of high numbers of sexual partners (especially among men), making women and girls more vulnerable to HIV transmission and negative sexual reproductive health outcomes (Booth, 2004; Gilbert and Walker, 2002; Kathewara-Banda et al., 2005; UNAIDS, 2004a; UNAIDS, 2004b). It should be noted that these cultural beliefs are often held by both women and men in SSA.

Sexual Violence

Unequal gender relations are most starkly manifested in the form of violence against women which increases female risk of exposure to HIV transmission. Leclerc-Madlala put this more succinctly when he notes that “common to both young men and women is the belief that a man has a right, or even the duty, to force himself onto a woman who displays reluctance and shyness” (cited in Gilbert and Walker, 2002:1106). There exists a strong correlation between gender-based physical and sexual violence and women’s vulnerability to HIV/AIDS (Dunkle et al., 2004; Harrison et al., 2008; Jewekes, Levine, and Penn-Kekana, 2003; Kalichman et al., 2009; Kathewara-Banda et al., 2005; Larkin, 2000; Sa and Larsen, 2008). Gender-based violence (GBV) includes physical violence, psychological violence, economic violence, and sexual violence which interact and combine to enforce and perpetuate unequal power relations between men and women (Katherwara-Banda et al., 2005). Katherwara-Banda et al. (2005:651) define sexual violence as “any acts that deny the sexual and reproductive health rights of women.” Violence in this context could therefore be a “form of male power and domination which contributes directly or indirectly to women’s vulnerability to HIV” (Gupta, 2000:3). According to the Joint United Nations program on AIDS, gender-based violence “is now one of the leading factors for HIV infection” (UNAIDS, 2004a:47). Power imbalance in combination with women’s risk for sexual assault within sexual relationships in SSA increases their risks for STDs including HIV (Kalichman et al., 2009).

Gupta (2000) contends that violence or the fear of violence is the main reason women refrain from negotiating safer sex with their partners, confronting infidelity or better still leaving high-risk sexual relationships. Dunkle et al. (2004) suggest that there is

a complex inter-relationship between partner violence and couples' sexual practices.

They further suggest that a full understanding of the associations between gender-based inequalities in intimate partnerships requires that researchers capture and contrast an array of abusive experiences by exploring the associations between violence, inequality, and risk behavior. Only by doing this will researchers take into account the breath of this issue which Katherwara-Banda et al. (2005) posit is not only a reflection of social, cultural, and economic inequalities between men and women, but the ensuing power struggles between the sexes which gives rise to a specific dichotomous relationship of victim and perpetrator.

Dunkle et al. (2004) found that among women attending antenatal clinics in South Africa, higher levels of intimate partner violence and male control in a woman's current relationship were all associated with positive HIV status. Moreover, sexual violence was only associated with HIV if it co-occurred with physical violence. Studies indicate that HIV-positive women were more likely to have experienced more unwanted sexual contact and relationship violence than HIV-negative women (Dunkle et al., 2004; UNAIDS, 1998). This pattern is also common in non-Sub-Saharan contexts. For example, Dude (2007) shows that physical violence perpetrated by a sexual partner is significantly associated with increased lifetime risk of acquiring an STI including HIV in Ukraine.

For women therefore, violence or the threat of violence is a huge impediment to refusing unprotected sex and/or leaving high risk relationships. In certain regions, the low use of testing centers by females is sometimes driven by the fear of violence which also affects their ability to talk to their partners or others of their HIV status especially if they

are HIV-positive. Rate of spousal disclosure of HIV status to partners is also often determined by the perceived threat of violence or abandonment (Türmen, 2003).

Kalichman et al. (2009:269) contend therefore that “it is the adversarial attitudes toward women and the social acceptance of violence against women that directly influences HIV transmission risk.”

Of course, men’s violence against women not only increases risk of HIV infection for women, but also increases men’s own risk as well. Violence against a female partner as well as the probability that a man will contract a sexually transmitted disease is more likely among men who hold traditional views about masculinity (Ehrhardt et al., 2009). Peacock et al. (2009) argue that the very norms that cause damage to women also cause damage to men and this aspect is often neglected by researchers, as evidenced by the fact that men who hold traditional views are more likely to have contracted a STI (Peacock et al., 2009).

Structural Violence

While interpersonal relationships reflect social and cultural norms, gender roles are often seen as part of deeper societal-level political and economic structures of power and inequality. Thus an explanation of sexual behaviors requires a deeper exploration of the ways that gender and sexuality are influenced by a multifaceted interaction of social, cultural, and economic forces that determine the division of power. For example, Greig et al. (2008) note that women are the producers of two-thirds of the food in the developing world but however, own less than 15 percent of the land. This form of inequality has been cited as an example of “structural violence.” Structural violence is “a form of economic

abuse that is based upon a connection between poverty and women's subordinate status" (Katherwara-Banda et al., 2005:652). Larkin (2000) has argued that it is important to view women's lack of access to and control of resources as a form of societal-level structural violence that "operates as a conduit for the gendered transmission of AIDS." Kathewara-Banda et al. (2005) argue that sexual violence is not only perpetrated by individuals, but also include institutions and the state whose social, legal, or political-economic systems protect, enable and even encourage the pervasiveness of sexual violence in society. These structural constraints disfavor women such that they lack any real choice and have little leverage to change their circumstances. For example, economic dependence (which has structural roots) limits a woman's ability to "demand safer sex, engage in non-sexual economic activities, or to leave high risk relationships," all of which are strongly related to her negotiating power in sexual relationships (Greig et al., 2008; Gupta, 2000).

Female low social status is a reflection of pervasive gender inequalities that characterize most regions in Sub-Saharan Africa, which is manifested in "low levels of employment, income and education; inadequate political representation and lack of access to resources such as health care, transport, housing and government bureaucracy" (Gilbert and Walker 2002:1106). Gender inequality is therefore one of the key variables contributing to the high transmission rate of HIV and other sexually transmitted diseases among women in the region (Booth, 2004; Dugassa, 2009; Gilbert and Walker, 2002; Katherwara-Banda et al., 2005; Sa and Larsen, 2008).

Efforts to increase the economic independence of women are often assumed to increase their ability to negotiate safe sexual practices. The surge of microcredit

programs in many developing countries over the last 10 years is one example of strategies to empower women economically, and some argue is a good starting point (Bärnighausen et al., 2007; Gillespie et al., 2007; Kim and Waats, 2005; Mishra et al., 2007b; Msamanga et al., 2006; Wojcicki, 2005). Whether these micro credit programs are working or will work in the long run is not yet clear, however, since female rates of HIV are still very high. There is evidence that in the short run, increasing women's economic resources can generate demands for change in partnership roles and power, which may induce negative reactions from male partners (Wojcicki, 2005). As a result, some have concluded that a short-term increase in women's wealth without corresponding protective legal frameworks is not an effective solution (Kathewara-Banda et al., 2005).

Interaction Between Gender, SES, and HIV

The complicated relationships between culture, economics, and health are reflected in the interactions between gender, SES and HIV. As noted above, for different women, both "economic hardship and economic prosperity can result in increased risks of HIV for women" (MacLachan et al., 2009:363). First, gender is clearly linked to poverty. Poor women are both more vulnerable to HIV infection and to suffering from the impacts of AIDS. Poor women are economically dependent on men and have less control over decision making within the relationship which puts them at increase risk of HIV infection. The phenomenon of "feminized poverty" has explicitly been linked to female susceptibility to HIV infection. For poor women it is argued that their involvement in transactional sex or their weak position in negotiating sexual behavior within relationships is directly related to their economic powerlessness (Dugassa, 2009; Gillies, Tolley, and Wolstenholme, 1996; Kathewara-Banda et al., 2005; MacLachan et

al., 2009; Mbirimtengerenji, 2007; Sa and Larsen, 2008). Poverty affects both women and men. However, the particular vulnerability of poor women and girls is magnified by cultural gender norms that grant men power and status over women (Doyal, 2000).

Meanwhile, the risks of HIV infection for higher SES women may be primarily mediated by norms of sexual behavior among their male partners. For men, the probability of having multiple sexual partners increases with education and income in Sub-Saharan Africa (Kapiga and Lugalla, 2002; Kongyuy, 2006). Being economically stable makes it possible for men to afford to have sexual relationships with multiple partners, and the power and status of wealthy men gives them greater opportunity, ability, and even the expectation for sexual relationships outside of marriage or committed relationships. Given the widespread nature of the HIV epidemic in Sub-Saharan Africa, having as few as two lifetime partners substantially increases the probability of being in a relationship with an HIV-positive partner (Mishra et al., 2007a; Msisha et al., 2008; Wojcicki, 2005). In turn, this affects the risks of HIV exposure for relatively wealthier women compared to poorer women in Sub-Saharan Africa. At the same time wealthier men appear to be more likely to use condoms than poorer men (Msisha et al., 2008). This could be a function of the fact that wealthy men are able to afford condoms more than poorer men (Mishra et al., 2007a).

While marriage to wealthy men improves women's SES, it can also increase the likelihood they are exposed to HIV as a result of being part of a bigger sexual network (Msisha et al., 2008). Access to independent funds might also put higher SES women at increased risk of HIV infection because it can facilitate opportunities to travel or access to more partners (Wojcicki, 2005). Similarly, women from all SES classes who acquire

new sources of wealth and income might be at an increased risk of violence from partners because of threats to masculinity.

Research Setting

Cameroon

This study focuses on Cameroon, a country in the west of Sub-Saharan Africa (see figure 1). Cameroon was selected because fewer studies have been done on the HIV/AIDS crises in West Africa and because Cameroon has one of the higher HIV rates in the West African region.

The Republic of Cameroon (French: République du Cameroun) is found in the central and western part of Africa. As seen on figure 2-1, Cameroon is bordered by Nigeria to the west; Chad to the northeast; the Central African Republic to the east; and Equatorial Guinea, Gabon, and the Republic of Congo to the south. Most commonly referred to as “Africa in Miniature” for its geological and cultural diversity, its natural features include beaches, deserts, mountains, rainforests, and savannas. Cameroon is home to more than two hundred ethnic and linguistic groups and has as its largest cities Douala and Yaoundé (Mbaku, 2005).

Cameroon was originally occupied by the Portuguese but after the first world war became a territory that was divided between Britain and France as part of the League of Nations Mandate. French Cameroon gained independence in 1960 while the British-run southern Cameroon in 1961 decided to merge with French Cameroon to form the Federal Republic of Cameroon. In a 1972 referendum, the country was renamed the United

Republic of Cameroon, but changed its name again in 1984 to the Republic of Cameroon (Fanso, 1989). Because of their colonial heritage, Cameroon has English and French as their official languages as well as language of instruction in its schools. This colonial heritage has caused a linguistic divide between the fifth of the mainly English speaking population who mostly live in the northwest and southwestern region and the French speaking reminder who live in the rest of the country. In terms of religion, Protestants are concentrated in the two English-speaking regions of the country, Muslims in the north and Catholics in the southern and western regions (DeLancey and DeLancey, 2000).

Though Cameroon compared to other African countries enjoys relatively high political and social stability, a great number still live in poverty with their main source of income being mostly subsistence farming. In terms of human development, education is mostly free for children as they have access to subsidized or state-run schools. It is asserted that girls attend school less regularly than boys due to cultural attitudes, domestic duties, early marriage and pregnancy, and sexual harassment (Mbaku, 2005). However, Cameroon has one of the highest rates of school attendance in Africa. According to a 2001 estimate, an estimated 67.9 percent of the population 15 years of age or older were literate, including 77 percent of males and 60 percent of females (World Factbook, 2009).

The quality of health care is generally low with most of the facilities outside of the major cities being dirty and poorly equipped. Endemic diseases include malaria, meningitis, and sleeping sickness.



Figure 2-1: Map of Cameroon (Source: United Nations, 2004)

As noted in the literature review above, the HIV/AIDS seroprevalence is estimated at 5.5 percent for those aged 15-49. Interestingly despite a lot influence from western culture, traditional healers remain a popular alternative to western medicine (Lantum and Monono, 2005).

According to a 2009 UN estimate the current population of Cameroon is 19,522,000. They estimate that the population is young with 40.9 percent under 15 and 96.7 percent under 65. The birth rates are estimated at 34.1 births per 1,000 people and a death rate at 12.2. The average life expectancy in Cameroon is reported to be at 53.7 (52.9 for males and 54.5 for women) (World Factbook, 2009). Cameroon's population is almost evenly divided between urban and rural dwellers.

HIV/AIDS in Cameroon

Approximately 5.5 percent of Cameroon's population is estimated to be infected with HIV/AIDS (ORC Macro, 2005), one of the highest rates in West Africa and ten times the prevalence of HIV in the United States. The 2004 Cameroon Demographic Health Survey (CDHS) indicates that the overall HIV infection rates are about sixty percent higher in women (6.4 %) than among men (4.1%), and both men and women in urban areas have considerably higher rates of HIV than men and women in the rural areas (Figure 2.2). The *World Factbook* (2009) estimates that about 57 percent of Cameroon's total population are urban dwellers, which may in part explain the high prevalence of HIV/AIDS in urban areas (Garcia-Calleja et al., 1992).

HIV Prevalence in Cameroon, 2004

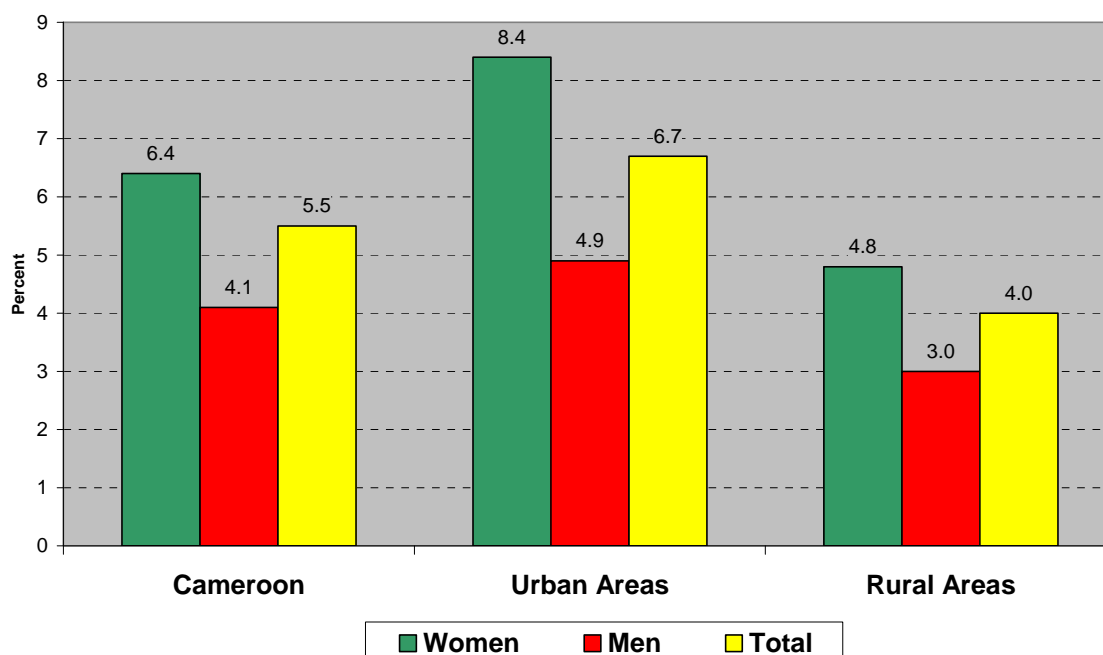


Figure 2-2: HIV Prevalence in Cameroon, by Gender and Place of Residence

Other characteristics of the HIV epidemic in Cameroon are similar to those in the rest of Sub-Saharan Africa. The main mode of transmission is heterosexual and the epidemic primarily affects the young, sexually active population. Like with other African studies most of the sexual relationships are male dominated, and female perceptions about their ability to refuse sex or the timing of sex, as well as negotiating condom use and fidelity is limited and varies by level of education (Hattori and DeRose, 2008; Kéou et al., 1998; Moore, Gullone, and McArthur, 2004). Studies have showed that sexual domination on the part of males is justified as a sign of love and passion which alludes to

cultural socializations that permit the acceptance of high risk behaviors on the part of both men and women (Moore et al., 2004; Rwenge, 2001).

In terms of condom use, it is reportedly extremely low (6.6%), with non-regular partners and rates of casual sex quite high especially among males (Moore et al., 2004). Some researchers argue that female status in Cameroon has a direct impact on their ability to use condoms and even the frequency of condom use. It is argued that female use of condoms is directly or indirectly impacted by the age disparities with their partners, discussion among couples on issues of sexuality as well as the process of decision making within households. To support this assertion is a study by Rwenge (2003) who concludes that unless female empowerment is increased considerably in Cameroon, condom use will generally remain low among women in this country. It is also argued that among younger girls it is more difficult for them to negotiate or insist on condom because of economic constraints than it is for the young boys. Among the highly educated the desire for condom use is even greater but the affordability of female condoms is a big issue in Cameroon, since female condoms are said to be quite expensive (Nkuo-Akenji et al., 2007). Moreover a study shows that females are more likely than males to purchase male condoms. However, their male partners are less likely to consent to using condoms during sexual intercourse (Nkuo-Akenji et al., 2007). A conclusion from the above suggests that higher educated females have higher levels of knowledge on STIs and HIV prevention as presented by Nkuo-Akenji et al. (2007); however, evidence also indicates that this knowledge does not necessarily translate to patterns of protective sexual behavior, therefore accounting for some of the HIV rates that we see among high SES females in Cameroon.

On the other end of the spectrum most studies have also linked high rates of HIV/AIDS among women in Cameroon to poverty. Poverty interacts with other factors, including levels of adolescent sexual activity, early sexual debut, greater commodification of sex and high degrees of physical abuse and sexual coercion (Moore et al., 2004). The basic argument is that a lack power at the societal/cultural level may strengthen a lack of power at the individual level (similar to the discussion of structural violence above). Farmer (1999:79) puts it more succinctly when he notes that “structural violence means that some women are, from the outset, at higher risk of HIV infection while other women are shielded from the risk.” I surmise that though women are not at the outset at equal risk of HIV, they all however, become at increased risk through various political, social and economic processes that puts them at a disadvantage. Therefore a clear understanding of the mechanisms that puts them at risk is vital. In my previous research (Reither and Mumah, 2009), we sought to explain the relationship between education and risk of HIV among Cameroonian women. In our findings we did find that highly educated women seemed to be more susceptible to the HIV. When other theoretical relevant variables such as marital status, age, and region were added to our analysis we saw an attenuation of this relationship, indicating that the education-HIV relationship is mediated by other variables. As an extension of that previous project, the goal of this present research is to better understand how various mechanisms protect or put at risk women in Cameroon depending on their socioeconomic status.

Summary

This chapter is in no way an exhaustive summary of all the materials related to women, SES, and HIV in Sub-Saharan Africa in general and Cameroon in particular, but includes a summary of the materials deemed most relevant to this project. This chapter serves as a source of brief history of the Sub-Saharan HIV/AIDS crisis and a review of the main issues associated with female vulnerability to HIV in the region. As discussed above, although there is no consensus on the exact relationship between SES and HIV status, women from all SES classes in Sub-Saharan Africa face profound economic, legal, cultural and social disadvantages (compared to men) which increase their vulnerability to HIV infection. The rights of women to own property and/or inherit wealth are rare, and levels of infidelity, sexual assault, and other forms of violence are relatively high. Given the enormous social, cultural, and economic impediments women face, they often find themselves powerless to negotiate protective practices with their male partners and their low economic power may force them into transactional sex for survival. Due to lack of power within their relationships, it is argued that women faithful to one partner are at risk of becoming HIV-positive as a result of their partner's sexual activities outside of the relationship.

This study explores the intersections of women, SES, and HIV in Cameroon. Using data from the 2004 Cameroon Demographic and Health Survey (CDHS), I seek to expand our understanding of the different mechanisms that render Cameroonian women vulnerable to HIV infection, and how these mechanisms differ by a woman's socioeconomic status.

A review of the literature indicates that there is an intrinsic interaction between SES and HIV. The literature however, presents a paradox in which both low and high SES women seem to be at high risk of HIV infection, but the distinct mechanisms that seem to put women in these two groups at risk is not clear. There is some evidence that social, cultural, and economic forces linked to SES class may influence the incidence of risky sexual behaviors, levels of exposure to HIV infected males, and female ability to use protective behaviors to avoid risk of becoming infected with HIV within sexual relationships.

A complete discussion on the relationship between gender inequality and HIV/AIDS would require an examination of the drivers of infection rates for both men and women. However, to keep my analysis tractable, in the present study I focus on patterns of HIV infection among Cameroonian women. Starting with women is justified because their higher infection rates suggest that special attention is needed to understand what puts them at increase risk. Future work could expand this analysis to include considerations of the impact of SES and gender on rates of male HIV infection.

CHAPTER 3

DATA AND METHODS

This section describes the data and methods used in this study. I begin by reviewing the research questions and theoretical model guiding my work. I then present several specific research hypotheses that I address in my analysis. The next section will describe the 2004 Cameroon Demographic and Health Survey (CDHS) and discuss the strengths and limitations of these data. I outline in some detail how the CDHS dataset can be used to operationalize the key variables used in this study. Finally, I review the analytical procedures I used in this project, including univariate and bivariate descriptive statistics and multivariate logistic regression

Research Questions

This study addresses two primary research questions. The first question focuses on general factors linked to the incidence of female HIV, while the second question explores the interaction between women and SES as predictors of HIV in Cameroon.

1. Why are the benefits of better economic status not impacting the risk of HIV for high SES women in Cameroon?

I will begin by examining the general bivariate associations between key demographic and contextual factors and the rate of HIV infection among women in Cameroon. More importantly the suggested the benefits of increased access to resources associated with lowered vulnerability to HIV among women in most developed nations doesn't seem to be necessarily the case among high SES women in

some Sub-Saharan countries, Cameroon included. This study tries to examine this dilemma by examining what protective benefits of high SES are missing among Cameroonian women which seemingly increase their vulnerability to HIV. This initial analysis is guided by the extensive literature on HIV in Sub-Saharan Africa, and provides a baseline for the more detailed analyses outlined below.

2. Do the mechanisms that put women at increase risk of HIV in Cameroon differ by SES

This question broadly attempts to understand the complex interaction between socioeconomic status and gender-based norms that influence sexual behavior which increases risk of HIV among women. Literature clearly indicates that women of both high and low SES could be at increase risk. However, what is not clear in the literature is what are the distinct mechanisms differentiated by SES that put these different sub-groups of women at increase risk of HIV. Specifically:

- a. How does SES affect the ability of women to avoid behaviors that expose them to HIV risk?**
- b. How does SES influence access to knowledge, health care cultural norms, and power within relationships that influence behaviors that increase women's risk of HIV?**

Conventional epidemiology argues that individuals should with the help of improved SES be able to improve on their health status. In the case of HIV in SSA in general and Cameroon in particular, preliminary studies suggest

that high SES is positively associated with HIV risk factor (Reither and Mumah, 2009). This question attempts to explain how high and low SES status may put women at risk of HIV through different mechanisms.

Conceptual Model

A conceptual model outlining the most important theoretical causal pathways that link SES and HIV for women is presented in Figure 3-1. In this model, SES is captured in three ways, including measures of both household wealth and individual education and occupation. SES in Cameroon is difficult to measure by just one variable for various reasons. Most important is the fact that a female's wealth is mostly tied to that of her household or partner, while her education and occupation serve as somewhat independent individual traits. According to the data and literature review this division best captures the multidimensionality of SES as well as its complex attributes.

Standard pathways linking SES and health outcomes are captured by measures of access to health care and knowledge of HIV and prevention methods. Access to health care includes measures of behavior (e.g., visits to voluntary counseling centers) as well as geographic factors (such as distance to health facility). A female's ability to access health care will influence her knowledge about HIV. In turn, female knowledge of HIV and prevention methods is presumed to influence female behaviors which could be risky or protective, thereby determining her HIV status.

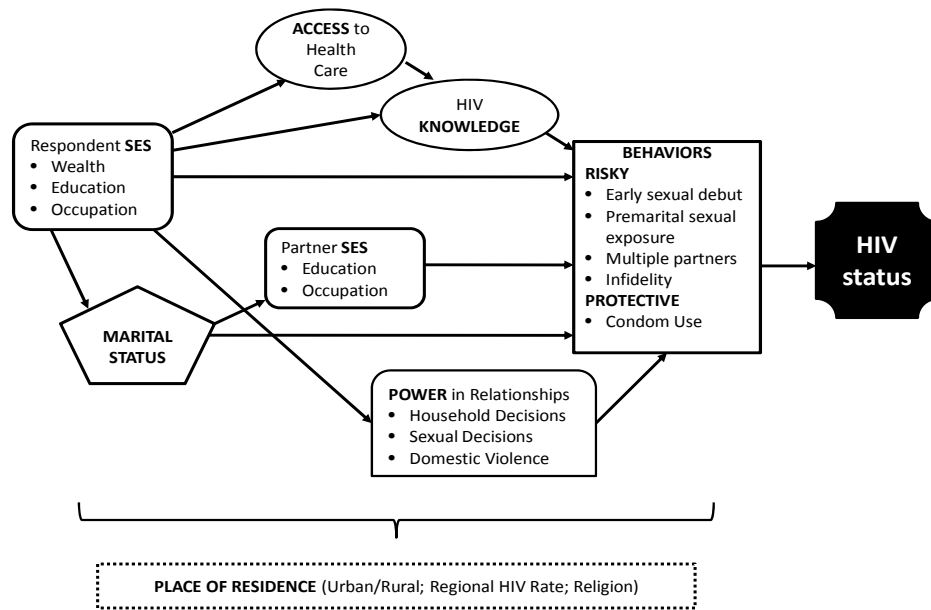
Partner's behavior is argued in the literature to be one of the most important pathways determining a woman's susceptibility to HIV infection. Initially, since not all women have partners, the impact of partners on her HIV risk is mediated by her marital

status and history. Female SES has been linked both to the timing and nature of marriage and to the SES of her partner. In turn, partner's behavior is influenced by his wealth and occupational status. Since the CDHS does not include direct measures of a woman's partner's behaviors, I rely on indicators of partner education and occupational status which have been linked to culturally appropriate behaviors that put women at greater risk of HIV.

SES is also theoretically linked to a woman's power in her sexual relationships, which in turn should influence the behaviors of both women and their partners. Power in relationships is conceptualized here as including three aspects: the ability to make decisions with regards to sexual and household decisions, and views about the legitimacy of physical or sexual violence within relationships. The key idea I am trying to capture here is that the more power a woman commands in her relationship the less risky her and her partner's behaviors will be.

Ultimately, the only variables that directly impact HIV status are sexual behaviors that expose (or protect) women from contracting the disease. As a result, in my conceptual model, I expect the impact of all other factors to affect HIV through their effects on behavior. Female behaviors in the CDHS include indicators for behaviors that either put her at risk of HIV infection (more premarital sex, infidelity, multiple partners) or protect her from HIV infection (condom use).

Finally, this conceptual model controls for place of residence. The key idea being that there are large regional and urban/rural differences within the country and a study of SES and risk of HIV needs to take these contextual factors into consideration. Examples of contextual factors include the background rate of HIV in the local population, regional



Previous literature provides suggestions for the kinds of patterns I expect to find among my sample of women from Cameroon. In this research, specific hypotheses and expectations include:

H1. As indicated by the standard epidemiology literature, ***I expect high SES women to report increased benefits from having access to resources, which should reduce their risk of HIV infection.*** Specifically,

H1a. Among high SES women, I expect their greater access to resources to increase their access to health care, increase their awareness of HIV and HIV prevention methods, and reduce risky sexual behaviors, which should in turn reduce their risk of HIV.

H1b. Among low SES women, I expect their economic vulnerability to reduce their access to health care facilities, limit their knowledge of HIV and HIV prevention methods, limit the amount of power they wield within a relationship, and to initiate sexual activity early, should increase their risk of HIV.

H2. As per the research literature ***I do however, expect high SES women to use more protective behaviors but to also report more risky sexual behaviors which should increase their risk of HIV. Specifically:***

H2a. Among high SES women I expect that their later age at first marriage (which increases the number of years they are involved in pre-marital sexual behavior) will directly increase their risk of HIV.

H2b. Among low SES woman I expect there to be lower rates of reported polygamous marriages which should reduce their risk of HIV.

H2c. Among high SES women I expect there to be higher rates of infidelity and an increased incidence of multiple sexual partners, which should increase the risk of HIV.

H2d. *I expect partner's SES in Cameroon to play an important (indirect) role in female risk of HIV. Specifically, I expect women in the high SES group to also report partners in similar or higher SES group which should in turn increase their risk of HIV, because their partners were more likely to practice riskier sexual behaviors.*

H3. Based on previous research (Reither and Mumah, 2009) and other research literature, ***I expect there to be different mechanisms that will put the different sub groups of women (low vs. high SES) at direct risks of HIV exposure.*** I expect that as I control for SES that the traditional models as enumerated by most epidemiologic studies will apply more to low SES, while for high SES women I expect norms and behaviors related to dating and marriage to provide a more significant effect on predicting HIV risk.

Specifically;

H3a. *For low SES women, I expect that traditional determinants such as limited access to health facilities, lower knowledge of HIV and HIV prevention methods, limited power within relationships and early sexual exposure would increase their risk of HIV. On the other hand, factors such as early marriage and being currently in monogamous relationships should provide more of a protective effect.*

H3b. *For high SES women, I expect that delayed marriage, having multiple partners (infidelity), longer years of premarital sexual exposure and partner's SES will be a significant driver in predicting HIV risk for these group of women.*

Data Description and Overview

Data Overview

This study utilizes data from the 2004 Cameroon Demography and Health Survey (CDHS). The 2004 CDHS is national representative survey involving household residents aged 15 and older, funded by U.S. Agency for International Development (USAID), The World Bank, the United Nations Children's Fund (UNICEF), the United Nations Population Fund (UNFPA) and the Government of Cameroon. An overview of the DHS indicates that it was first initiated in 1984 as an expansion of World Fertility Survey (WFS) and the Contraceptive Prevalence Surveys (CPS) (Boerma and Sommerfelt, 1993). The CDHS is just one of the thirty or more similar instruments and methodologies implemented under the DHS program umbrella which has been used to collect data from a large number of countries throughout Africa, Asia and Latin America.

The 2004 CDHS used a multi-stage complex cluster sampling methodology to achieve a nationally representative sample of 10,462 households in Cameroon. For this survey, clusters refer to small geographically defined areas which included all 10 provinces in Cameroon and the 2 major cities. Within these households, 5,280 men (ages 15-59) and 10,656 women (ages 15-49) were interviewed, with response rates well in excess of 90 percent.

Collecting DHS data is a four step process that can take anywhere from 1 – 20 months (INS and ORC Macro, 2004). The first step includes sample design and survey development tailored to the needs of the specific country, in this case Cameroon. The standard DHS survey includes a household questionnaire and a questionnaire for women.

In the case of Cameroon the B-core questionnaire was chosen because of the low prevalence of contraceptive use. In 2004 after two previous waves, the HIV/AIDS module was also added to the standard questionnaire. After this is done these survey instruments were then translated to local languages, pre-tested and then finalized.

In the second stage, training of field staff is conducted and eligible households are identified, selected and interviewed. Socio-demographic information (such as age, gender, education, etc.) as well as other data of each member in the household is recorded. All identified eligible females are interviewed using the female questionnaire whereas eligible males are interviewed in just 50 percent of the households and it is done through face-to-face interviews. Before the interviews are conducted, consent forms are administered which clearly stated the name of the interviewer, organization as well as the time required to complete the survey. Most importantly these consent forms held statements informing the respondents of the anonymous nature of their responses as well as confidentiality of these answers while acknowledging that the respondent had the right to refuse answering any question or discontinue the interview at any time.

The third step involves data processing, including editing, coding, entering and verifying data, as well as checking for consistency. With the DHS, standardized procedures mean that data editing and entry are simultaneously done with data collection in order to improve data quality as well as the speedy dissemination of preliminary results. In the fourth stage the survey data then becomes available to researchers.

The DHS surveys provide information on variety of different topics that are tailored to the specific interest of each host country. Individual questionnaires can include information on marriage, fertility, family planning, reproductive health, child health, and

HIV/AIDS. One of the most important components of DHS data is the inclusion of population-based HIV testing. As a result, the DHS is a reliable source for estimating national rates of HIV infection. The ability to link the HIV testing with the individual questions also provides researchers with the ability to carry in depth analysis of the socio-demographic and behavioral factors that may be associated with HIV infection. The AIDS Indicator Survey collects data on background characteristics, pattern of marital unions, age at sexual debut, pattern of sexual behavior in the last 12 months, condom use, experience with sexually transmitted infections (STIs) and treatment response to self-reported STIs, knowledge and attitudes related to HIV/AIDS, and coverage of HIV-testing (ORC Macro, 2005).

With regards to HIV testing in the CDHS, the process is made quite simple; blood spots are collected on filter paper from a finger prick and transported to a laboratory for testing. The laboratory protocol includes an initial ELISA test, and then retesting of all positive tests and 10 percent of the negative tests with a second ELISA. For those tests with discordant results on the two ELISA tests, a Western blot test is performed. Also noteworthy is the fact that testing is anonymous and so survey respondents cannot be provided with their results. They are, however, offered referrals for free voluntary counseling and testing (VCT) and AIDS educational materials. Eligibility for HIV testing is done through a systematic random sampling process of selected households. In the case of Cameroon only about 7.9 percent of the 5703 women eligible for testing did not provide an HIV sample (Adair, 2007; Mishra et al., 2006; Measure DHS, 2005). Mishra et al. (2006) assessed the results from the first eight countries to include HIV testing in their DHS (including Cameroon) and documented that previous estimates for generalized

HIV rates based off testing at antenatal clinics were unreliable, with the clinic data mostly useful for tracking trends than for estimating overall disease incidence. The limitations of such surveillance systems mean that some groups are underrepresented such as non-pregnant women, remote rural areas and men. To them the primary advantage to using nationally representative data such as the DHS is that “the added value of population based surveys is primarily that they provide direct data on the distribution of HIV infection among the general adult population, remote rural population (often a large part of the population), men, young non-pregnant women and regions or provinces.” (Mishra et al. 2006:542). Another strong advantage of the DHS is the quality of its data as it has invested in survey design and implementation with experienced organizations (Mishra et al., 2006).

A potential limitation of the CDHS data could have been high non response rates since this is a large scale survey. However, the overall response rates in the 2004 CDHS for households was 97.6 percent, with response rates for women at about 94.3 percent, and 92.1 percent of these women accepting to be tested for HIV (Mishra et al., 2006). Not having to deal with excessive non response rates additionally makes the 2004 CDHS quite attractive for examining the research questions outlined above.

Data Description

The DHS data is made available to researchers and it is generally released twelve months after the end field work. A DHS data archive is maintained at the website www.measuredhs.com, with datasets made available through a simple process of electronic registration. The process of getting the data off the website is quite

straightforward. To request data access, researchers are required to create an account which includes filling out the reason and topic of the research, as well as the country of interest. Once all the information is deemed complete, review and access is granted within 24 hours. In the case of Cameroon, the 2004 DHS has nine different datasets: Births Recode, Couple's Recode, Household Recode, Height and Weight Recode, Individual Recode, Children's Recode, Male Recode, Household Member Recode and HIV datasets. For this study I downloaded all but two of the data sets (Male Recode and Height and Weight Recode).

In preparation for analysis, I merged three of the datasets: Household Recode, HIV datasets and Individual Recode. To merge the individual file and Household file, Individual data was used as the base data set (women only dataset), and merged using the unique case id number assigned to each woman. This allowed me to ability to locate the correct household information associated with each woman in the sample. After merging the individual and household data, the HIV dataset was the merged to this new data source. To match individuals to their HIV result, individual cases were sorted by their case ID and an equivalent ID was created from the HIV dataset by multiplying their "HIV cluster" by 1000000, their "HIV number" by 1000, and their "HIV line number" by 1 (and summing the resulting three variables).

After the merging the datasets, variables that were not going to be used (variables relating to malaria, child nutrition etc.) were dropped to reduce computing and memory requirements. To adequately reflect key concepts utilized in this study, some of the variables had to be constructed from a blend of different variables, and this is described in the detail in the following section. For all descriptive statistics, sampling weights were

used to account for the degree to which a woman's chances of being selected for the sample depended on household size and other DHS sampling criteria. For bivariate and multivariate statistics, the unweighted sample was used because though there were very slight differences in values, there were no meaningful or substantive differences between results from the weighted and unweighted samples.

Operationalization of Variables

This study examines a core dependent variable (HIV status) and five main sets of independent variables: Socioeconomic status (SES), access to health care and knowledge of HIV and prevention methods, power in relationships, sexual behavior of respondent, and marital status. Control variables for region, place of residence and age of respondent were also examined. These different independent mechanisms are theorized to put women at increased risk of HIV. Detailed descriptions of the variables are included in the following sections.

Measurement of Dependent Variable

HIV Status

The overall objective of this research was to develop a model that can predict an individual's HIV status. According to Centers for Disease Prevention (CDC) "HIV (human immunodeficiency virus) is the virus that causes AIDS [acquired immune deficiency syndrome]. This virus may be passed from one person to another when infected blood, semen, or vaginal secretions come in contact with an uninfected person's broken skin or mucous membranes" (Center for Disease Control, 2009).

Most individuals who are HIV infected will eventually develop AIDS as a result of their HIV infection. Consistent with the CDHS, HIV status was determined using voluntary blood samples provided by eligible female respondents. HIV status is coded as a dichotomous variable reflecting whether an individual's test was HIV positive or HIV negative (Table 3.1).

Among the 5,155 women in the CDHS sample for whom HIV status is known, the CDHS reports conclusive HIV test results for all but one case. Overall, 6.6 percent of the women in the 2004 CDHS survey tested positive for HIV.

Table 3.1. Univariate Characteristics of Women in 2004 CDHS data

Indicator Variables	<i>n</i>	% of Women in DHS Sample	% Weighted Sample
<i>HIV Status</i>			
Negative	4,805	93.2	93.4
Positive	349	6.8	6.6

Measurement of Independent Variables

SES

SES is multidimensional concept that captures an individual's position within the broader social structure relative to others and it is usually measured based on education, occupation, income or wealth. In the case of the CDHS, there are multiple questions that can be used to operationalize a respondent's SES. To best capture the multidimensional nature and complexity of SES variable, other studies (Mishra et al., 2007a; Mishra et al., 2009) suggest the use of three distinct variables: household wealth, female educational attainment, and female occupation (there is no reported data on personal or household income). In the context of Cameroon, SES is best divided into these three sub categories

because they capture both the household-level SES (in which a woman's wealth is strongly tied to that of the household, including her partner), while her educational attainment and occupational status reflect her independent socioeconomic agency.

Distributions of female CDHS respondents on each of these SES measures are shown in Table 3.2 below.

Wealth: The CDHS dataset includes a composite measure of household wealth. The CDHS measures household living standards based on a household's ownership of assets, materials for housing construction, and access to water and sanitation facilities. The wealth index reported in the CDHS (V190) divides households into five different quintiles and is coded as a five point ordinal scale ranging from 1 to 5, with higher levels indicating more family wealth. In my multivariate analyses I use a recoded version of this variable, which collapses wealth into three categories, collapsing the top and bottom two categories to have a new recoded variable: low, medium, and high. Using this measure, 36 percent of women in Cameroon are in the two poorest wealth categories, about 19 percent are in the middle wealth group, while 44 percent of them were in the two richest categories.

Educational Attainment: Educational attainment for female respondents in the CDHS (V106) is derived from a question "what is your highest education level," and is reported in the data as an ordinal variable with four main categories: no formal education, primary education, secondary education, or higher education. The results suggest that roughly 22 percent of Cameroonian women have no education, and 39 percent had only a primary education, 37 percent had reached secondary school, while just 2 percent had a post-secondary training (Table 3.2).

Table 3.2. Socioeconomic Characteristics of Women in 2004 CDHS

Indicator Variables	<i>n</i>	% of Women in DHS Sample	% Weighted Sample
<i>Wealth Index</i>			
Poorest	886	17.2	18.4
Poorer	928	18.0	17.7
Middle	1,151	22.3	19.4
Richer	1,076	20.9	21.0
Richest	1,114	21.6	23.5
<i>Educational Attainment</i>			
No Education	1,019	19.8	22.0
Primary	2,120	41.1	39.4
Secondary	1,920	37.2	36.5
Higher	96	1.9	2.0
<i>Occupation (All)</i>			
Unemployed	1928	37.4	38.0
Professional	39	.8	.8
Clerical	63	1.2	1.3
Sales	15	.3	.3
Agric-Self Employed	1173	22.8	22.4
Agric-Employee	614	11.9	10.4
Household/Domestic	6	.9	.1
Services	107	2.1	2.1
Skilled Manual	183	3.5	3.9
Unskilled Manual	1012	19.6	20.7
<i>Occupation (Recoded Variable)</i>			
Unemployed	1,928	37.5	38.0
Professional/White Collar	224	4.4	4.5
Agriculture	1,787	34.8	32.8
Manual/Domestic	1,201	23.4	24.7

Occupational Status: Occupational status for female respondents in the CDHS (V717) is derived from the question “what is the respondent’s occupation?”, and is reported in the data as a categorical variable with nine different categories: not working, professional, technical; manager, clerical, sales, agric- self employed, agric-employee, household and domestic, services, skilled manual and unskilled manual. To simplify the analysis, I constructed a collapsed version similar to recoded versions reported in the existing literature using DHS datasets (e.g., Mishra et al., 2009, Msisha et al., 2008). The

collapsed version reduces categories from nine to four: unemployed, professional/white collar, agriculture and manual/domestic. Collapsing of the categories was done by combining professional, technical; manager, clerical, sales and services to make the ‘professional/white collar’ category; combining the categories household and domestic and skilled manual and unskilled manual to make the ‘manual/domestic’ category; agric- self employed, agric-employee made the ‘agriculture’ category and not working remained the same but was rename ‘unemployed’. Collapsing the categories to fewer identical categories allows me to maintain a lot of statistical strength during analysis, especially since some of the categories have very few observations within them. For full description, both versions are presented in Table 3.2 above.

Descriptive results suggest that 38 percent of women report being unemployed, while 5 percent report being in professional white collar occupations. The results also indicate that slightly more than 33 percent of women report being in the agricultural sector, while 24 percent work in manual/domestic jobs (Table 3.2). Interestingly, though unemployment is generally regarded as an indicator of low SES, my bivariate analysis will show that unemployment may be deceptive indicator of low SES, as a huge percentage of unemployed women also report being in high wealth households.

Partner’s Characteristics

Because of the relational nature of exposure to HIV transmission, a woman’s partner’s sexual behavior can be an important determinant of her HIV risk. However, the CDHS has no direct measure for respondent partners’ behaviors. This study relies on indicators of partners’ education and occupational status as a proxy for culturally-

determined sexual behaviors that might be linked to a woman's HIV status. In each case, controls for the absence of any partner are included in the analyses of partner SES variables reported in later chapters (see Table 3.3).

Table 3.3. Univariate Characteristics for Indicators of Partner's Characteristics, 2004 CDHS (Women Only)

Indicator Variables	<i>n</i>	% of Women in DHS Sample	% Weighted Sample
<i>Partner's Education</i>			
No Partner	1,172	22.8	23.1
No Education	807	15.7	17.6
Primary Education	1,203	23.3	22.9
Secondary	1,454	28.2	27.1
Higher	250	4.8	5.1
Don't Know	251	4.9	4.2
<i>Occupation (All)</i>			
No Partner	1172	23.0	23.3
Unemployed	107	2.1	2.1
Professional	336	6.5	6.9
Clerical	215	4.2	4.4
Sales	25	.5	.5
Agric-Self Employed	1125	21.8	21.5
Agric-Employee	548	10.8	9.6
Household/Domestic	13	.3	.3
Services	513	10.1	10.1
Skilled Manual	382	7.5	7.7
Unskilled Manual	653	12.8	13.7
<i>Partner's Occupation Recode</i>			
No Partner	1,172	23.0	23.3
Unemployed	107	2.1	2.1
Professional/White Collar	1,089	21.4	22.0
Agriculture	1,673	32.4	31.0
Manual/Domestic	1,048	20.6	21.6

Partner's Education: captures partner's highest educational attainment. This variable is captured from the specific question asked of respondents in the CDHS "partner's highest educational attainment" (V701). Since this question was asked only to women who indicated having or had a partner, data loss was avoided by creating an

indicator variable for women with no partner from the variable marital status (V501).

As seen on table 3.3, 18 percent of women reported a partner with no education while 23 percent indicated that their partners' had a primary level education. Twenty-seven percent of women reported partner's with a secondary education compared to just 5 percent who said their partner's had a post secondary education. Almost 4 percent of women in Cameroon however, indicated that they had no knowledge of their partner's level of education.

Partner's Occupation: Information on partners' occupation was captured from the CDHS variable: "partner's occupation" (V705). Since this question was asked only to women who indicated currently having or had a partner, data loss was avoided by creating an indicator variable for women with no partner from the variable marital status (V501). The original version of partner's occupation has 12 response categories: no partner, not working, professional/technical/manager, clerical, sales, agriculture-self employed agriculture-employee, household and domestic, services, skilled manual, unskilled manual, and missing. Collapsing these categories to fewer identical categories allow me maintain statistical strength during analysis, so a recoded version of this variable is created similar to the collapsed version for respondent's occupation. This recoded variable collapsed the 12 categories to six main categories: no partner, unemployed, professional/white collar, agriculture and manual/domestic and missing. Descriptive statistics show that while only 2 percent of the women reported having a partner who was unemployed, 22 percent indicated their partners were in professional/white collar jobs. The highest percentage (32%) reported their partners in the

agricultural sector, compared to 21 percent who were in the manual/domestic sector (see Table 3.3).

Access to Medical Care

It is argued that access to medical care greatly improves an individual's health status. How that impacts female HIV status is of interest in this study. To better capture this mechanism, access to health care is measured by three variables (Table 3.4).

Access to Centre de Dépistage Volontaire (CPDV): this variable reflects different levels of awareness and use of voluntary HIV counseling and testing clinics that are a primary source of HIV intervention in Cameroon. The final variable combined answers to three nested survey questions: “Heard of AIDS?” (V751) “Heard of CPDV?” (S816N) “Ever been to a CPDV?” (S816O); these three variables were combined to create a single variable with three levels measuring awareness and use of CPDVs. Results in Table 3.4 indicate that almost 74 percent of women had never heard of a voluntary testing and counseling center, while, 23 percent had heard of the CPDVs, but had never been to one. Only 3 percent of the sample had visited a CPDV, suggesting that CPDV's are not yet a major resource for the general population in Cameroon.

Visited health facility in the last 12 months: This variable reflects visits to general health facilities and it is derived from the CDHS question “visited a health facility in the last 12 months? (V394).” Almost 53 percent of women reported having been to a health facility in the previous twelve month.

Table 3.4. Univariate Characteristics for Indicators of Access to Health Care, 2004 CDHS (Women Only)

Indicator Variable	<i>n</i>	% of Women in DHS Sample	% Weighted Sample
<i>Access to CPDV</i>			
Not Heard of CPDV	3,822	74.2	73.6
Heard of but not Been	1,180	22.9	23.4
Been	149	2.9	3.0
<i>Visited Health Facility</i>			
No	2,449	47.5	47.4
Yes	2,706	52.5	52.6
<i>Barriers to Medical help</i>			
No Barriers	2,722	52.9	53.7
Faced at least 1 barrier	714	13.9	13.5
Faced at least 2 barriers	1,215	23.6	21.5
Faced at least 3 barriers	490	9.5	11.3

Access barriers to health clinics: This variable measures barriers respondents may face to accessing health clinics. There were several questions posed to women in this CDHS sample about potential barriers they may face reaching health clinics, and I used three questions to develop a single construct. Reliability analysis indicated that three specific questions: Getting Medical Help: Not knowing where to go (V467A), Getting Medical Help: Distance to the health facility is a barrier (V467D) and Getting Medical Help: Having to take transport (V467E) were the most similar in terms of measuring this construct. The additive scale created from these three dummy variables showed a Cronbach's alpha of .702, indicating that these three variables were not only correlated and therefore similar, but provided a reliable summative index. The resulting scale ranks the respondents from 0 to 3 with higher levels indicating greater numbers of barrier to medical care reported by the respondent (Table 3.4). The majority of the respondents

faced no barriers to accessing health clinics (54%), while 11 percent report facing all three barriers to accessing health clinics in the event of an illness. Similarly, 14 percent of women reported facing at least one of the barriers to accessing health clinics, compared to 22 percent of women who reported facing at least two barriers.

Knowledge of HIV and Prevention Methods

A female's knowledge of HIV and/or how to prevent HIV is argued to significantly determine her risk of acquiring HIV. Knowledge of HIV and prevention methods is measured via a scale constructed from several variables in the CDHS. Positive indicators include variables that measure a woman's correct knowledge of mechanisms of AIDS transmission and effective techniques to reduce risks. They are called positive indicators because they measure whether a woman is aware of information and strategies promoted by the medical community. The specific set of questions included a trigger question about whether the respondent had heard about AIDS (V751). Respondents that heard of AIDS were further asked if they knew any ways to avoid AIDS (V754Z). For those that responded that they knew ways to avoid AIDS, they were asked to list all the ways they knew to avoid AIDS.

Responses were consolidated by the CDHS researchers and are reported in a set of dichotomous variables (coded as 'mentioned' or 'not mentioned'). Respondents were then asked five questions on specific ways to reduce their chances of contracting or transmitting HIV. These included measures of "always use condoms during sex" (V754CP); "one sex partner with no other partner" (V754DP); "can a healthy person have AIDS" (V756); "can AIDS be transmitted from Mother to child" (V774); "Not

having Sex at all” (V754BP). In all, I combined 15 indicators for positive HIV knowledge to create a single additive index representing correct knowledge about how an individual can prevent getting infected by or transmitting HIV. The 15-item scale met conventional standards for statistical reliability (Cronbach’s alpha of .738) and ranges in value from 0-15. Table 3.5 shows the distribution of the fifteen positive indicator items used in the scale measuring knowledge and HIV prevention as well as results from the reliability analysis. This distribution indicates that almost 98 percent of women had heard of AIDS, with about 81 percent of them indicating that they knew of at least one way of either preventing or not transmitting the disease.

Table 3.5. Indicators Knowledge of HIV Prevention Methods, 2004 CDHS (Women Only)

Knowledge of HIV Prevention Indicators	Respondents who responded yes		
	<i>n</i>	%	% Weighted Sample
Has Heard of AIDS	5,044	97.9	97.9
Knows means of avoiding AIDS	4,188	81.2	80.7
Abstaining from Sex	2,165	42.0	43.9
Using condoms during sex	2,397	46.5	46.1
Avoid sex with IV drug users	19	.4	.4
Having only one partner	2,288	44.4	42.5
Avoid partners who have many partners	51	1.0	1.0
Avoiding sex with Prostitutes	55	1.1	1.2
Limit the number of sexual partners	300	5.8	5.7
Avoid sharing blades with AIDS patients	1,278	24.8	25.1
Can a Healthy person have AIDS	3,523	68.4	68.5
Can AIDS be transmitted from MTC	3,670	71.2	71.2
Always using condoms during Sex	3,518	68.2	68.2
One sex partner with no other partners	4,170	81.0	81.3
By not having sex at all	3,920	76.2	75.6
<i>Scale Statistics (Exploratory Factor Analysis)</i>			
Mean	7.10		7.09
Cronbach’s Alpha	.738		
Standard Deviation	2.63		2.64
N of Items	15		15

Power in Relationships

From the review of literature, it is suggested that power within relationships significantly influences a woman's risk of HIV (Mishra et al., 2009). Culturally, within Cameroon it is further argued that norms that guide behavior within relationships are of tremendous importance as women who have low economic or cultural power within relationships are at even increased risk of HIV infection compared to women who have more power. How these norms affect behavior within relationships, and how these links differ by SES are important focuses of this study. In the analysis below, I utilized CDHS data to calculate three constructs which measure different aspects of a respondents' power in her relationships. These three constructs reflect household decision making authority, power over sexual decision making, and attitudes toward physical violence.

Household decisions: Power over household decisions was estimated from several different items that directly measure who makes key decisions about different topics within the household. The resulting index utilized five items from the CDHS. Since each of these items had several answer categories, a recoded version of each was first created in which 0 reflected decisions were made by "others", 0.5 reflected decisions made by the 'respondent and partner/other person' and 1 if a category of decisions was made by the 'respondent alone.' Next, the five items were summed into an additive index scale with total scores ranging from 0-5. The resulting index had a Cronbach's alpha of .839, indicating that these items were a reliable measure.

As seen on Table 3.6, the percentage of respondents who have the lead decision making power within their households tends to be below 50 percent, with the exception

of food to be cooked each day. On average Cameroonian women do not appear to have a lot of domestic decision powers, with a mean total scale score of 1.8 out of 5.

Table 3.6. Indicators for Power in Relationship – Household Decision Making, 2004 CDHS (Women Only)

Household Decision Indicators	Respondents who responded yes		
	<i>n</i>	%	% Weighted Sample
<i>Household Decisions</i>			
Final say on:			
Own health care	1,091	21.2	20.9
Large household purchases	783	15.2	14.9
Purchases of daily needs	1,371	26.6	26.1
Visits to family or relatives	1,264	24.5	23.9
Food to be cooked each day	2,596	50.4	49.6
<i>Scale Statistics</i>			
Mean	1.84		1.81
Cronbach's Alpha	.827		
Standard Deviation	1.61		1.60
N of Items	5		5

Power over sexual decisions: Power over sexual decisions captures the respondent's views about how much say women should have within relationships or make sexual decisions, especially decisions that might impact HIV risks. The 2004 CDHS included no direct measures of actual power over sexual decisions within specific relationships, but rather explored a hypothetical question about circumstances under which a woman's would be justified in refusing sex to her husband. In this case power over sexual decisions is defined as a woman's perceived power to refuse sex to a spouse in the advent of certain hypothetical situations. Specifically, a scale was constructed from four different variables from the CDHS. These four variables were recoded, and an index

scale was created called Index Scale for Justifications for Wife Refusing Sex. Table 3.7 shows the distribution of these indicators as reported by the CDHS.

Descriptive statistics indicate that for all four individual items, more than 70 percent of women felt it was appropriate for a woman to refuse sex to a spouse. The highest percentage of women (87%) feel justified to refuse sex if the husband has a known case of STD, while the lowest percentage (71%) feel it was justified to refuse sex if the husband had other women. Perhaps the fact that this has the lowest percentage in the sample is indicative of cultural upbringing in which women are less likely to make an issue of it because it is normal for men to have other women, outside of their formal marital relationships. The additive scale had a mean of 3.3 (out of 5) and a somewhat modest reliability score (Cronbach's alpha of 0.579).

Attitude toward physical violence: Increasingly, studies have linked exposure to either sexual or physical violence to female susceptibility to HIV infection. Studies have indicated that females who were physically or sexually abused had higher rates of HIV partly because their exposure probably reduced their ability to require safer sex with their partners or to even disclose their HIV status for fear of violence. Very few have controlled for sexual or physical violence in Cameroon, as the data is not easily available. The CDHS did not include any direct measures of the incidence of domestic physical or sexual violence, but did indirectly measure each respondent's attitudes or opinions toward when they feel wife beating would be appropriate. After recoding the original items to reflect 1 if beating was considered justified, an additive was created that ranged from 0 to 5. Reliability analysis showed a Cronbach's alpha of .797, indicating strong reliability.

Table 3.7. Indicators for Power in Relationship - Sexual Decisions, 2004 CDHS (Women Only)

Sexual Decision Indicators	Respondents who responded yes		
	<i>n</i>	%	% Weighted Sample
<i>Sexual Decisions</i>			
Wife justified to refuse sex:			
If husband has STD	3,968	87.2	87.4
If husband has other women	3,239	71.1	71.9
If recent birth	3,912	85.9	86.2
If tired or not in mood	3,536	77.7	78.4
<i>Scale Statistics</i>			
Mean	3.30		3.33
Cronbach's Alpha	.579		
Standard Deviation	.953		.956
N of Items	4		4

Table 3.8 above shows the distribution of responses to the wife beating questions based on five specific scenarios (only the percent of women who responded that wife beating was justified is presented). The results indicate that wife beating is not frowned upon by all women; in fact up to 47 percent of the women in this sample indicated that wife beating will be justified if a woman neglected her children, while 35 percent said it was acceptable if the woman went out without permission. The lowest percentages in sample was just 21 percent of the women who thought wife beating will be justified if she burnt the food, while 22 percent indicated that wife beating will be justified if the woman refused her husband sex. The combined scale produced a mean value of 1.5 out of 5 possible points.

Table 3.8. Indicators for Power in Relationship – Attitude Toward Wife Beating, 2004 CDHS (Women Only)

Attitude Toward Wife Beating Indicators	Respondents who said yes		
	<i>n</i>	%	% Weighted Sample
<i>Attitude toward Wife Beating</i>			
Wife beating justified if:			
Goes out W/ Telling Him	1,715	33.3	34.5
Neglects the Children	2,375	46.1	46.8
Argues with Him	1,428	27.7	29.1
Refuses to have Sex with Him	1,051	20.4	22.0
Burns the Food	995	19.3	21.2
<i>Scale Statistics</i>			
Mean	1.53		1.61
Cronbach's Alpha	.797		
Standard Deviation	1.65		1.72
N of Items	5		5

Sexual Behaviors of Respondent

My approach to measuring the sexual behavior of women builds on evidence from other studies that identified condom use as a major mechanism to avoid HIV infection, and premarital sexual experience, multiple sexual partners, and mixing alcohol and sex as risky sexual behaviors that can contribute significantly in determining female vulnerability to HIV infection (Mishra et al., 2009). To best capture the sexual behaviors of women in Cameroon, I use two distinctive clusters of variables: indicators of female protective sexual behavior and female risky sexual behavior.

Female Protective Sexual Behavior

Female protective sexual behaviors are defined as sexual behaviors which ultimately decrease the risk of contracting HIV. Condom use is argued to significantly reduce a woman's risk of contracting HIV (Nkue-Akenji et al., 2007). In Cameroon,

female use of condoms is quite low and could be a significant reason for high rates among women in general (Mishra et al., 2009). In this study condom use is captured via three variables: current contraceptive method, condoms ever used, and used a condom at last sexual intercourse (Table 3.9). It is worth noting here that I am not measuring female condoms rather condom use refers to females getting their partners to use male condoms.

Current condom use: this variable measures a woman's current condom use and is captured from the variable in the CDHS 'current contraceptive use'. Respondents were asked a base question "ever used a contraceptive method?" if the response was yes, then respondents were asked to name their current contraceptive method. Current condom reflects women who indicated currently using it as a contraceptive method. Table 3.9 above indicates majority of women were not currently using condoms with just a little under 10 percent reporting current condom usage.

Table 3.9. Univariate Characteristics for Indicators of Protective Sexual behavior, 2004 CDHS (Women Only).

Indicator Variable	<i>n</i>	% of Women in DHS Sample	% Weighted Sample
<i>Current Condom Use</i>			
No	4,671	90.6	90.2
Yes	484	9.4	9.8
<i>Ever Used Condom</i>			
No	3,410	66.5	67.8
Yes	1,719	33.5	32.2
<i>Used Condom at Last Intercourse</i>			
No	4,498	88.7	88.7
Yes	575	11.1	11.3

Ever used condom: measures the number of women who at one point in their lives ever used a condom. This variable is derived from a section in the CDHS that asked respondents about a list of possible contraception practices and reports “who knew the method and had used it” (V305\$05). 32 percent of women reported that they knew about and had ever used a condom (Table 3.9).

Used condom at last sexual intercourse: measures women who used a condom during their last sexual intercourse and is calculated from a specific CDHS question did you “use a condom at last sexual intercourse” (V761). Importantly, the question was asked only to those who reported being sexually active in the last 12 months. Those who had no sexual intercourse in the last 12 months were given a zero value for this variable. Descriptive statistics indicate that only about 11 percent of women reported using a condom during their last sexual intercourse.

Female Risky Sexual Behaviors

Female risky sexual behaviors in this study are defined as sexual behaviors practiced by women, which could put them at increased risk of contracting HIV. Examples include use of alcohol during sex, initiating sexual activity at a young age, infidelity, and having multiple sexual partners.

Drank alcohol the last time had sex: measures alcohol intake during last sexual intercourse. This variable is measured from the question in the CDHS “drank alcohol last sexual intercourse?” (S518D). However, the question was asked only to those who were sexually active in the last 12 months. To include everyone in the sample, those who had no sexual intercourse in the last 12 months were given a value to reflect ‘no sex last 12

months'. The results suggest that 24 percent of women reported no sexual intercourse in the previous 12 months, compared to 62 percent of the women who reported having sexual intercourse but with no consumption of any alcohol. Among those where alcohol was consumed at their last sexual intercourse, 1 percent reported drinking by the respondent alone, 10 percent by the respondent's partner alone, while 4 percent was consumed by both the respondent and her partner (see Table 3.10 below).

Early sexual exposure: Early sexual exposure is a dummy variable created to control for females who were sexually active at early ages. Early sexual exposure is defined in this study as females having their first sexual encounter before age 15. This dummy variable was computed by recoding the variable 'age at first intercourse' (V531). As shown on Table 3.10, 65 percent of women in the CDHS had their first sexual exposure above age 15, compared to 35 percent who reported having first sexual exposure under age 15.

Married but had sex with person other than husband: measures the number of women who were currently married yet had sex with a man other than her husband. This variable was created by combining information from two variables in the CDHS: current marital status (V501) and number of sexual partners other than husband in last 12 months (V766A). To compute this variable, respondents who were currently in a union and who had intercourse with another man other than husband were coded 'yes'; Those who were currently married but reported no intercourse with a man other than husband and those who were formerly married or never married were coded 'no'. Descriptive statistics indicate that over 9 percent of women had sexual intercourse with men who were not their husbands (see Table 3.10).

Total sexual partners last 12 months: measures the number of sexual partners a woman had in the last 12 months. This is taken from specific question in the CDHS “total number of partners in the last 12 months?” (V766B). A dummy variable was created to reflect respondents who reported more than 1 sexual partner over the previous year with respondents who had reported more than 1 sexual partner in the last 12 months coded as ‘yes’ while those who reported 1 or less ‘no’. Descriptive statistics indicate that about 6 percent of women in the CDHS reported more than 1 sexual partner in the last 12 months (Table 3.10).

Table 3.10. Univariate Characteristics for Indicators of Risky Sexual behavior, 2004 CDHS (Women Only).

Indicator Variable	<i>n</i>	% of Women in DHS Sample	% Weighted Sample
<i>Drank Alcohol at Last Sex</i>			
No Sex Last 12 Months	1,219	23.7	24.1
Had Sex No Alcohol	3,164	61.5	61.7
Respondent Only	50	1.0	.9
Partner Only	490	9.5	9.0
Respondent and Partner	221	4.3	4.4
<i>Early Sexual Exposure – Dummy</i>			
1 st Exposure 15+	3,347	65.0	64.5
1 st Sexual Exposure under 15	1,800	35.0	35.5
<i>Married but Had Sex with Person Other than Husband</i>			
No	4,648	90.5	90.7
Yes	489	9.5	9.3
<i>More Than 1 Sexual Partner Last 12 Months-Dummy</i>			
No	4,793	93.3	93.9
Yes	344	6.7	6.1

Length of premarital sexual experience: Literature indicates that the amount of time a woman experiences premarital sexual activity is an important determinant of her HIV status. Although the CDHS has no direct measure of this variable, it was possible to calculate using three different measures: current age (V012), age at first intercourse (V525) and age at first marriage (V511). For women who currently are or have previously been married, premarital sexual experience is measured as the number of years between first intercourse and first marriage. In the case of women who have never married, premarital sexual activity is the difference between age at first intercourse and current age. Descriptive results indicate that length of premarital sexual for women in the CDHS ranged from '0' years to '29' years, with a mean of 1.80 and a standard deviation of 3.38 (see table 3.11).

Years of sexual experience: Years of sexual experience measures the number of years women in this sample have been sexually active (table 3.11). Years of sexual experience is computed by looking at number of years between the individual's current age (V012) and their age of first intercourse (V531). Descriptive results show years of sexual exposure ranges from 0 years to 41 years, with a mean of 13.5 years and standard deviation of 8.7.

Table 3.11. Univariate Characteristics for Indicators of Risky Sexual behavior, 2004 CDHS (Women Only).

Indicator Variable	CDHS Sample	Weighted Sample
<i>Years of Premarital Sexual Exposure</i>		
Mean	1.93	1.80
Stand Deviation	3.48	3.38
<i>Years of Sexual Exposure</i>		
Mean	13.47	13.46
Stand Deviation	8.71	8.65

Marital Status

Because HIV is a disease most frequently contracted through sexual contact with a partner, the role of marriage and marital status has often been an important variable used to understand patterns of HIV infection (Adair, 2008; Mishra et al., 2009). In my analysis, I used CHDS variables to calculate four measures of marital status:

Marital status: As reported in the CDHS (V501), respondent's marital status is divided into 5 categories: never married, married, living together, widowed, divorced, and not living together (or separated). The survey results suggest that 53 percent of Cameroonian women in 2004 were currently married compared to 1 percent who were divorced, 5 percent who were separated, and 3 percent that were widowed. Another 23 percent reported never being married, while 15 percent were cohabitating.

Age at first marriage: Age at first marriage in the CDHS is a variable that measures the age a woman got into her first marital union. It is measured from the CDHS variable "age at first marriage" (V511). For my analyses I collapsed the reported values for age at first marriage into three categories: early marriage (under 16), intermediate (at age 17-19) and late marriage (20 and over). Descriptive statistics suggest that 39 percent of women got into their first union under age 16, 20 percent between the ages of 17 and 19, and 18 percent of the women did not marry until they were at least 20 years old.

Polygamous marriage: A dummy variable for polygamous marriage was created to identify females in relationships in which there were multiple wives. This variable is computed with information from the variable "number of wives" (V505). Descriptive statistics suggest that about 21 Percent of women in this sample were in polygamous unions (Table 3.12).

Formerly married: Finally, I created a dummy variable to capture women who were previously married, but were now divorced, widowed or separated. The variable was created with information from the CDHS variable ‘current marital status’ (V501). Almost 9 percent of the women in the sample were divorced, widowed or separated at the time of the interview (Table 3.12).

Table 3.12. Univariate Characteristics for Indicators of Marital Status, 2004 CDHS (Women Only)

Indicator Variables	<i>n</i>	% of Women in DHS Sample	% Weighted Sample
<i>Marital Status</i>			
Never Married	1,172	22.7	23.0
Currently Married	2,686	52.1	53.1
Living Together	859	16.7	15.4
Widowed	133	2.6	2.6
Divorced	56	1.1	1.2
Not Living Together	249	4.8	4.7
<i>Age at first Marriage-Recode</i>			
Never Married	1,172	22.7	23.0
Early Marriage Under 16 Yrs	1,939	37.6	38.6
Middle Age Group 17-19	1,049	20.3	20.0
Late Marriage 20+	995	19.3	18.4
<i>Polygamous Marriage – Dummy</i>			
No	4,070	79.2	78.6
Yes	1,069	20.8	21.4
<i>Formerly Married</i>			
No	4,717	91.5	91.5
Yes	438	8.5	8.5

Control Variables

In examining the distinct pathways that put women of different SES at risk of HIV we must take into consideration the large regional differences that exist within the country. According to Adair (2008) the population of the central region is predominantly

wealthier and more likely to be Christians compared to the northern region which is predominantly poor, Muslim, and with little education. Specifically, majority of Protestants are likely to be in the North West and South West region, Catholics in the southern and western region, while the north has mostly people of the Muslim faith. Due to the colonial heritage, roughly 20 percent of the English speaking Cameroonians live mostly in the North and South West regions, while the rest of the country speaks mostly French (DeLancey and DeLancey, 2000). The 2004 CDHS as an individual nationally representative data gives me the ability to gain insights into the relationship between HIV status and different independent mechanisms across all regional and socioeconomic groups. Extant literature also suggests evidence of an association between religious affiliation and individual's reproductive behavior. There is some evidence that norms associated with specific religions may influence beliefs and attitudes that could impact HIV vulnerability. In this study the control variables will be region, place of residence, regional HIV, respondent's age, and religious affiliation. These variables are included to see if there is any relationship with HIV risk and the various independent variables explained by regional factors. Table 3.13 gives the distribution of these variables in the CDHS.

Region, ethnic groups, regional HIV, and type of place of residence:

Characteristics of the respondents' place of residence is measured using several variables from the CDHS. Region is measured using the variable "region" (V101). In the 2004 CDHS region is separated into ten provinces and 2 major cities (see Table 3.13). These provinces are: Adamaoua, Centre, Est, Extreme, Nord, Littoral, Nord, Nord Ouest, Ouest, Sud, Sud Ouest. The 2 major cities included are Douala and Yaoundé. According to

Kuate-Defo (1997), the ten regions in Cameroon can also be subdivided into four major cultural regions: ethnic groups from Center, South and East; ethnic groups from Littoral and South West; ethnic groups from West and North West; and ethnic groups from Nord, Adamaoua and Extreme Nord. Kuate-Defo (1997) further contends that the more than 200 ethnic groups in Cameroon fall into these four major categories and therefore this collapsed version of region will be used as a proxy for ethnicity.

Another variable created from region of residence is a continuous variable representing the regional HIV rate. This variable is created by calculating the percent of HIV positive women within each region. Regional HIV is important because it captures the residual effect that other control variables such as religion and place of residence may not capture. Since this variable is used in the multivariate section, a table with descriptive information on this variable is found in chapter V.

Type of place of residence is measured via the question “type of place of residence” (V102). This variable is measured via two response categories ‘urban’ and ‘rural.’ As seen on Table 3.13, 46 percent of the women were in areas considered rural, while 54 percent were in areas considered urban.

Age: In the CDHS, each respondent’s age is reported in discrete years ‘respondents age’ (V013). In my analysis, I utilized a continuous variable for respondent age. To illustrate the age profile of the respondent population, Table 3.13 (above) reports the proportion of women in 7 different age groups: 15- 19, 20-24, 25- 29, 30-34, 35-39, 40-44, 45-49. The results suggest that a quarter of the sample consisted of women in their late teens, almost 40 percent was in their 20s, 23 percent in their 30s, and the remaining 14 percent in their 40s. It is worth noting that the CDHS sample was designed

to be a representative sample of women between 15-49 years old, so younger and older women were not included.

Table 3.13. Univariate Characteristics for Control variables, 2004 CDHS (Women Only)

Indicator Variables	<i>n</i>	% of Women in DHS Sample	% Weighted Sample
<i>Place of Residence</i>			
Urban	2,483	48.2	53.6
Rural	2,672	51.8	46.4
<i>Region of Residence (Ethnic Groups)</i>			
<u>Group 1</u>			
Centre	460	8.9	8.7
Sud	388	7.5	4.4
Est	363	7.0	5.0
<i>Combined</i>	1,211	23.5	18.1
<u>Group 2</u>			
Littoral	411	8.0	4.6
Sud Ouest	386	7.5	7.3
<i>Combined</i>	797	15.5	12.0
<u>Group 3</u>			
Ouest	511	9.9	10.4
Nord Ouest	425	8.2	10.3
<i>Combined</i>	936	18.2	20.7
<u>Group 4</u>			
Nord	438	8.5	8.7
Adamaoua	394	7.6	4.1
Extrême Nord	496	9.6	16.1
<i>Combined</i>	1,328	25.8	28.9
<u>Major Cities</u>			
Douala	482	9.4	11.1
Yaoundé	401	7.8	9.2

Religious affiliation: In the CDHS religious affiliation is reported via eight categories under “Religion” (V130): Catholic, Protestant, Muslim, Animist, Buddhist-Hindu, Other, No religion and new religions. For this study, this variable is collapsed to four main indicator categories: Catholic, Protestant, Muslim and Other. The results in table 3.13 above suggest that over 36 percent of women identified with the Catholic faith,

34 percent indicated they were of the protestant faith, while 18 percent reported being Muslim. Over 10 percent indicated being a part of “other faith” including no religious faith.

Table 3.14. Univariate Characteristics for Control variables, 2004 CDHS (Women Only)

Indicator Variables	<i>n</i>	% of Women in DHS Sample	% Weighted Sample
<i>Respondent's Age - 5 Year Groups</i>			
15 – 19	1,280	24.8	24.9
20 – 24	1,068	20.7	21.1
25 – 29	852	16.5	16.6
30 – 34	677	13.1	13.1
35 – 39	519	10.1	9.9
40 – 44	416	8.1	7.9
45 – 49	343	6.7	6.5
<i>Religious Affiliation</i>			
Catholic	1,962	38.1	36.9
Protestant	1,822	35.4	34.2
Muslim	871	19.9	18.3
Other	494	9.6	10.6

Analytical Methods

This research employs univariate, bivariate and multivariate analyses and focuses on individual women as my unit of analysis. I utilize information about respondent partner and household characteristics to contextualize the individual respondents.

Univariate and Bivariate Analyses

Univariate analyses were used above to describe the characteristics and demographics of the female respondents in the CDHS. These basic descriptive analyses included simple frequencies and percentages of responses on individual questions as well as averages for continuous variables. Univariate analyses help summarize the

characteristics of respondents and suggest important patterns that are explored in my bivariate and multivariate analyses in the next two chapters.

Bivariate analyses are utilized in Chapter 4 to look for patterns and associations between the various independent variables and the indicator of HIV status. Three types of bivariate analyses are used: cross tabulations, ANOVA-tests, and *t*-tests. Cross tabulations are used to examine the distribution of women on most of the key independent categorical variables as well as the dependent variable (HIV status). ANOVA and *t*-tests are employed on my continuous variables to test for significant differences in means across categories of categorical variables.

Chi-square tests are used to determine if there is a statistical relationship between the categorical variables analyzed in cross tabulations. Chi-square is a symmetric measure of association designed to identify differences in frequencies for nominal variables and it is based on the chi-square statistic (Field, 2005). Measures for the strength of association used in the bivariate analyses also include the Fishers' Exact Test, Cramer's V and gamma. Fisher's Exact Tests are used for 2x2 tables only, while Cramer's V is used on larger tables with more categories. Both tests have values ranging from 0 to 1 with 0 indicating that there is no relationship and 1 indicating a perfect relationship. Gamma is used to detect the strength and direction in the variables that are measured at the ordinal level. Gamma is a symmetric measure of association that has values ranging from 0 to ± 1 , with 0 indicating no relationship and 1 indicating a perfect relationship (Field, 2005). Gamma also indicates the direction of the relationship. These set of analyses will help answer my first research question, which seeks to first identify the primary factors associated with female rates of HIV in Cameroon. In addition, the

results from bivariate analyses are used to guide my multivariate model specification choices.

Multivariate Analyses

Multivariate analyses are usually used for studying relationships among several interrelated variables, and allow the researcher to examine and consider complex statistical relationships among several independent variables and a single dependent variable. In this study I use logistic regression models because the outcome variable HIV status is a binary variable (HIV positive or negative). Because only one of two answers is possible for a binary outcome, traditional ordinary least squares linear regression is inappropriate and provides illogical estimated values that often exceed the observed range of possibilities. By contrast, logistic regression allows the researcher to predict a discrete binary outcome using a probabilistic framework that predicts the chance of a positive outcome using sets of independent variables that may be continuous, discrete, dichotomous, or a mix. In this dissertation, logistic regression allows me the ability to predict the probability or test the odds that a woman would test negative or positive for HIV given certain information. According to Tabachnick and Fidell (2005), one of the advantages to using logistic regression is the fact that it requires fewer assumptions than ordinary least squares linear regression. Specifically, logistic regressions make no assumptions about the distribution of the predictor variables and so predictors with a normal distribution are not a necessity. Moreover, the predictors do not have to be linearly related, or have equal variances within each group.

A key distinction between multiple regression and logistic regression coefficient estimates is that with multiple regression, we are predicting the outcome variable from a combination of each predictor variable multiplied by its respective regression coefficient. In logistic regression, instead of predicting the value of the outcome variable from a predictor variable or several variables (as is the case with this study), we predict the probability of the event occurring, given known values of our variables (Field, 2005). Because the model produced by logistic regression is therefore nonlinear, the equations used to describe the outcomes are slightly more complex than those used with multiple regressions. The underlying equation behind logistic regression models can be expressed as:

$$P(Y) = \frac{1}{1 + e^{-(b_0 + b_1 X_1 + \varepsilon_i)}}$$

in which $P(Y)$ is the probability of Y occurring, e is the base of the natural logarithm, b_0 is the constant, b_1 is the regression coefficient of the corresponding X_1 predictor variable, and ε_i is the error. As with linear regression you can also have multiple predictors within one equation, which then becomes:

$$P(Y) = \frac{1}{1 + e^{-(b_0 + b_1 X_1 + b_2 X_2 + \dots + b_j X_j + \varepsilon_i)}}$$

where everything stays same as with single predictor equation but $b_j X_j$ refers to regression estimates for the set of predictor variables (1 through k) included in each of the logistic regression model. This linear regression equation creates the logit or the log of the odds as is expressed as:

$$\ln \left[P \left(Y = \frac{1}{1 - Y} \right) \right] = \beta_0 + \sum_{j=1}^k \beta_j X_j,$$

where $\ln \left[P \left(Y = \frac{1}{1+Y} \right) \right]$ indicates the natural log of the probability of being in one group divided by the probability of being in the other group, β_0 refers to the intercept of the regression model, and $\beta_j X_j$ refers to regression estimates for the set of predictor variables (1 through k) included in each of the models. As we can see from the equation, each predictor variable has its own coefficient, so we need to estimate the value of these coefficients we can actually solve the equation.

Estimation of the values of these predictor variables is done using the maximum likelihood estimation procedure. According to Tabachnick and Fidell (2005:518), the maximum likelihood estimation “is an iterative procedure that starts with arbitrary values of coefficients and determines the direction and size of change in the coefficients that will maximize the likelihood of obtaining the observed frequencies.” In other words, maximum likelihood estimation selects the coefficients that make the observed values more likely to have happened. We are trying to fit our estimated model to the data in such a way that it allows us to estimate the values for our dependent variable based on the known values of our predictor variable or variables.

In its logit form, logistic regression coefficients are interpreted as the change in the log odds associated with one unit change in the independent variable. However, the interpretation of logistic regression is made easier with the use of odds ratios. The logistic regression model can be rewritten in terms of the odds of event occurring. The odds of an event occurring are defined as the ratio of the probability that an event will occur to the probability that that the event will not occur (Menard, 1995; Norusis/SPSS Inc., 1990). For example the odds of testing positive for HIV are the probability of testing positive

divided by the probability of testing negative. In formal terms, the logistic regression equation can then be written as:

$$odds = \frac{prob(event)}{prob(no\ event)} = e^{B_0 + B_1X_1 + \dots + B_pX_p} = e^{B_0} e^{B_1X_1} \dots e^{B_pX_p}$$

where e raised to the power B_i is the factor by which the odds change when the i th independent variable increases by one unit. If B_i is positive, this factor will be greater than 1, which indicates increased odds; if B_i is negative, the factor will be less than 1, which indicates decreased odds. If however, B_i is 0, the factor equals 1, and will leave the odds unchanged. The proportionate change in odds is also known as $\exp b$.

Once models have been estimated, the next step is assessing how well the logistic regression model performs. These measures assess how well the model fits the data, as well as how well they predict the outcome variable. They are known as goodness of fit measures and measures of predictive adequacy. One way to assess the reliability of the model or its predictive adequacy, is to compare our predictions to observed outcomes. This is known as the classification table: this table checks to see how many cases the model correctly classifies, when the outcome or the predicted probability for the outcome is known. Another way to assess the reliability of a model is looking at the strength of the relationship between the outcome variable and the set of predictors in the model. In other words, you are looking for the proportion of the variability in the outcome variable that is accounted for by the set of predictors in that model. For this study, the measures of strength of association used are the Cox and Snell (R^2_{CS}) and the Nagelkerke (R^2_N) R-squares, which will be discussed further in Chapter 5 below.

Assessing goodness of fit can be done using two different measures: the -2 log likelihood and the Homer and Lemeshow test. The first method of assessing goodness of fit is to examine how likely the sample results are, given the parameter estimates. Known as *likelihood* it is the probability of the observed results, given the estimates of our predictors (Norusis/SPSS Inc., 1990). It is argued that given the fact that the likelihood is a small number less than 1, it is routine to use -2 times the log of the likelihood (-2LL) as a measure of how well the estimated model fits the data. A good model will be one that results in a high likelihood of the observed results. A model that fits perfectly will have a likelihood of 1, and -2 times the log likelihood is 0. -2LL are tested against models with just the intercept which test the null hypothesis that the observed likelihood does not differ from 1. For nested models, -2LL are compared between models to assess the improvement of adding or deleting predictors from models (see Chapter 5 for a more in depth discussion of -2LL).

Another method of assessing goodness of fit is the Homer and Lemeshow test (H&L) which test the hypothesis that the observed data are significantly different from the predicted values from the model (Field, 2005). Another way of thinking of this test is how close to the real world are the values predicted by the model. To this effect a non-significant test is desired because it will indicate that there are no significant differences between the values predicted by the model and those observed in the data, therefore a fair depiction of real world data.

As with other statistical techniques, logistic regression has its limitations. As noted traditional OLS assumptions that the predictors have to be normally distributed are not required for logistic regression, but having multivariate linearity among predictors

may actually enhance their predictive power. According to Tabachnick and Fidell (2005), this is because a linear combination is actually used to form the exponent. Additionally, logistic regression is quite sensitive to small sample sizes. A few problems may occur when there are too few cases relative to the number of predictors. One of such problems is that the models may produce extremely large parameter estimates and standard errors, with the possibility it will fail to converge when the combinations of discrete variables result in too many cells with no cases. This study has a sample size of over five thousand, and should technically not be a problem, though in case this happens it is suggested that the researcher either collapse the categories within the problematic predictor variable, delete the problematic category within the predictor variable or alternatively, if the predictor is not theoretically relevant to the analysis, delete it completely. Also logistic regression, like other varieties of multiple regression, is sensitive to extremely high correlations among predictor variables, which is signaled by standard errors for parameter estimates and/ or failure of a tolerance test. Unfortunately, there is no way within logistic regression to find the source of multicollinearity among the predictors. Rather, Field (2005) has suggested that multicollinearity diagnostics test output from traditional OLS multiple regression procedures can be a valid way to identify unusually high linear relationships among predictor variables. To eliminate multicollinearity, deletion of one or more of the redundant variables from the model is recommended. A correlation matrix for all model variables used in this study and results of collinearity diagnostics are discussed in more detail in Chapter 5.

CHAPTER 4

FINDINGS FROM BIVARIATE ANALYSES

This chapter explores the bivariate relationships between major clusters of independent variables and the HIV status of women in Cameroon. This chapter also summarizes some important linkages between socioeconomic status and other key independent variables that are associated with HIV risk.

Relationship Between HIV and Independent Variables

Socioeconomic Status by HIV Status

As noted earlier in the literature review, socioeconomic status is presumed to affect an individual's risk of HIV infection, and in the Cameroonian case, affects women more than it does men. Based on analyses from the 2004 CDHS, women in the highest wealth quintile were more likely to test positive for HIV infection than women in the lowest wealth quintile (Table 4.1). In fact, there is an almost step wise increase in HIV rates with any increase in the wealth category except for the highest wealth category. Women in the two lowest wealth quintiles have the lowest rates of HIV (4.1 and 4.2 percent, respectively) compared to women in the middle and two highest wealth quintiles (7.6, 8.9 and 8.1 percent, respectively). Even when this wealth category is collapsed to three categories (low, medium and high, not shown) the relationship remains the same, with wealth significantly positively associated with a woman's HIV status, with an even stronger strength of association (gamma .248; $p < .001$).

Table 4.1. Socioeconomic Status by HIV Status, Measured in Percentages

Table 4.1. Socioeconomic Status by HIV Status, Measured in Percentages			
Indicator Variables	% of Women in CDHS	% HIV Positive	X ² , degrees of freedom, gamma or Cramer's V
<i>Wealth Index</i>			
Poorest	17.2	4.1	32.34***, 4, .194
Poor	18.0	4.2	
Middle	22.3	7.6	
Richer	20.9	8.9	
Richest	21.6	8.1	
<i>N = 5154</i>			
<i>Educational attainment</i>			
No Education	19.1	3.9	20.27***, 3, .173
Primary Education	41.1	7.0	
Secondary Education	37.3	8.2	
Higher	1.9	4.2	
<i>N = 5154</i>			
<i>Occupation (Recode)</i>			
Unemployed	37.5	5.8	24.083***, 3, .068
Professional/White Collar	4.4	8.0	
Agriculture	34.8	5.7	
Manual/Domestic	23.4	9.7	
<i>N = 5139</i>			
<i>Occupation (All)</i>			
Unemployed	37.5	5.8	38.784***, 9, .087
Professional	.8	15.4	
Clerical	1.2	7.9	
Sales	.3	13.3	
Agric-Self Employed	22.8	5.0	
Agric-Employee	11.9	6.8	
Household/Domestic	.1	33.3	
Services	2.1	4.7	
Skilled Manual	3.6	7.7	
Unskilled Manual	19.7	10.0	
*p<.05 **p<.01 ***p<.001			

There is also a significant positive association between a woman's educational attainment and rates of HIV infection (Table 4.1). Women with primary and secondary level education had higher rates of HIV infection (7.0 and 8.2 percent, respectively)

compared to women with no education (3.9 percent). However, the analyses also reveal a decline in HIV rates among the small number of Cameroonian women who report having a post-secondary education (4.2 percent), indicating that the women most at risk were those with primary and secondary level education.

A woman's occupation was also significantly related to a woman's HIV status (Table 4.1). Women in both professional/white collar and manual/domestic jobs had significantly higher rates of HIV infection (8.0 and 9.7 percent, respectively) compared to women who were unemployed (5.8 percent) and women who were in the agricultural sector (5.7 percent). However, it is likely that the unemployed women in this sample are not necessarily economically marginalized individuals. As will be discussed below, the majority of women with both higher education and living in high wealth households were unemployed.

Overall, the findings presented in this section are not surprising as other studies have found similar results in which SES is positively associated with rates of HIV among women in Cameroon (Glynn et al., 2004; Mishra et al. 2007a; Reither and Mumah, 2009). Mishra et al. (2007a) using DHS data for eight African countries found that for most countries Cameroon included, HIV prevalence was highest among the wealthiest 20 percent of households compared to the poorest 20 percent. In Reither and Mumah (2009) we found that highly educated women were more likely to test positive for HIV, compared to women with no formal or primary level education. However, our multivariate analysis showed that controlling for other variables such as marital status, diminished this relationship. This is the basis of multivariate analysis done later in the study, to see if the HIV-SES relationship holds true.

Partner's Characteristics by HIV Status

Partner's characteristics, in this case SES, are argued to indirectly affect a woman's risk of HIV infection because men in the higher SES category are more likely to have multiple concurrent partners, less likely to use condoms with women other their partners, all of which increases risk for women. Among the women in the CDHS sample, there is a significant positive relationship between a woman's HIV status and her partner's SES. As shown on table 4.2 below, women with no partners or whose partners had no education had the lowest rates of HIV (3.5 percent each). As partners' education levels rose, a woman's risk of HIV increased tremendously. Women whose partner had a primary level education had a seven percent HIV infection rate, while women whose partner had a secondary level education had a nine percent infection rate. The highest HIV infection rates were among women with college educated partners (almost 13 percent). Interestingly women who did not even know or report their partner's education attainment also had high rates of HIV infection (10 percent) compared to women whose partners had no education.

A woman's partner's occupation was also significantly associated with her HIV status. Women whose partners were in agricultural occupations or who were unemployed had lower HIV infection rates (4.7 and 4.3 percent, respectively) compared to the HIV infection rates of women whose partners were in the manual/domestic (10 percent) and professional/white collar (11 percent) occupations. This result supports indirectly the theory that for some high SES women, her risk of HIV is mediated by the sexual behavioral patterns of her husband. The literature does argue that as a man's SES increases, he is more likely to engage in riskier sexual behaviors. Kongyuy et al. (2006)

found in their study of Cameroonian men that the wealthy men were more likely to have had at least two concurrent sex partners in the last twelve months, they were also less to have used as condom in their last sexual intercourse with a non-spousal partner. This may be as a result of opportunities afforded them from resources they possess, as well as in most of SSA it is culturally acceptable or even expected for higher status men to have multiple partners. The fact that high SES women have higher rates might be in part possibly explained by the association with partners' SES.

Table 4.2. Partner's Characteristics by HIV Status, Measured in Percentages

Indicator Variables	% of Women in CDHS	% HIV Positive	χ^2 , degrees of freedom, gamma or Cramer's V
Partner's Education			
No Partner	22.8	3.5	66.56***, 5, .309
No Education	15.7	3.5	
Primary Education	23.3	7.3	
Secondary	28.2	9.2	
Higher	4.8	12.8	
Don't Know	4.9	10.0	
Partner's Occupation Recode			
No Partner	23.0	3.5	84.47***, 4, .129
Unemployed	2.1	4.7	
Prof/White Collar	21.4	10.8	
Agriculture	32.4	4.3	
Manual/Domestic	20.6	10.0	

*p<.05 **p<.01 ***p<.001

Access to Health Care by HIV Status

Access to health care in Cameroon appears to be positively associated with a woman's HIV status. As seen on Table 4.2, women who reported having been to a Centre de Dépistage Volontaire (CPDV; Voluntary Counseling and Testing Centre) had a higher incidence of HIV (14.1 percent) than those who had not heard of CPDVs or had heard but not visited one (6.5 and 6.9 percent, respectively). This finding was not limited to CPDV

clinics (which are specifically designed to respond to the HIV crisis). Women who visited any type of health care facility in the last twelve months had notably higher HIV rates (7.9 percent) than women who had not visited any health facility (5.5 percent).

Another indicator of access to health care is whether or not respondents perceived any significant barriers to accessing health care services in the previous year. Again, women who reported facing more barriers to health care facilities (including transportation, distance, and knowledge/ knowing where to go) have notably lower HIV rates (4.9 percent) compared to women who reported facing zero barriers to health care facilities (8.0 percent). Indeed, there appears to be a linear inverse relationship between the number of barriers women face to accessing health care facilities and their chances of having HIV.

In all three cases, the cross-sectional nature of the 2004 CDHS data makes it difficult to determine the causal order of these relationships (i.e. Did the visit to health facility happen before or after the diagnoses of HIV infection). Most likely, women were more inclined to visit a health facility because they are already feeling ill, which would be more likely if they had already contracted the disease. It is also possible that the statistical association between HIV and access to health care is spurious. As shown below higher SES women were more likely to report greater use of and fewer barriers to accessing health care, and also had higher rates of HIV infection.

Table 4.3. Access to Health Care by HIV Status, Measured in Percentages

Indicator Variables	% of Women in CDHS	% HIV Positive	X ² , degrees of freedom, gamma or Cramer's V
<i>Access to CPDV</i>			
Not Heard of CPDV	74.2	6.5	13.24***, 2, .051
Heard of but not Been	22.9	6.9	
Been	2.9	14.1	
<i>N = 5150</i>			
<i>Visited Health Facility</i>			
No	47.5	5.5	12.49***, 1, .049
Yes	52.5	7.9	
<i>N = 5154</i>			
<i>Barriers to Medical help</i>			
No Barriers	52.9	8.0	15.15, 3***, .183
Faced at least 1 barrier	13.9	5.5	
Faced at least 2 barriers	23.6	5.4	
Faced at least 3 barriers	9.5	4.9	
<i>N = 5140</i>			
*p<.05 **p<.01 ***p<.001			

Knowledge of HIV and Prevention Methods by HIV Status

In the literature on HIV, knowledge of prevention methods is universally thought to reduce the chances of HIV infection. In general, the patterns in the DHS dataset suggest the reverse pattern. Table 4.3 shows the mean score on an HIV knowledge index for women who were HIV positive and negative. The results suggest statistically significant higher scores on the knowledge index for HIV positive women (Table 4.4).

As with access to health care, this positive relationship between knowledge of HIV prevention and HIV infection rates may just be a function of reverse causality as women who have already contracted HIV were more likely develop better knowledge of the diseases, as well as issues pertaining to the disease. Alternatively, high SES status is linked to both HIV risk and higher knowledge about HIV.

Table 4.4. Knowledge of HIV and Prevention Methods by HIV Status

<i>Indicator</i>	Negative	Standard Deviation	Positive	Standard Deviation	<i>t</i>	<i>Significance (2-tailed)</i>
<i>Mean Score for Index Reflecting Knowledge of HIV & HIV Prevention Methods</i>	7.06	2.65	7.69	2.16	-4.29	<0.001

**Note: $N = 5,131$

Though Mishra et al. (2009) used different CDHS indicators of knowledge of HIV to test for prevalence, their obtained results were similar. Knowledge of HIV was significantly positively associated with higher HIV prevalence. However, it is worth noting that in their study the difference between women who reported knowledge of the three measured prevention strategies (monogamy, abstinence, and condom use) and women who didn't know was very small.

Power in Relationships by HIV Status

As mentioned in Chapter 3, women's power within their relationships is measured in the CDHS survey by three different clusters of variables: attitudes toward wife beating, household decision making and perceptions about the appropriate power of women in sexual decision-making. The index for attitudes toward wife beating was not significantly related with HIV status (Table 4.5). Similarly, the index for respondent views toward women's power in sexual decision-making (specifically, the conditions under which a wife would be justified in refusing sex with her husband) was not significantly related to HIV. In both cases, the indicators are likely weakened by the fact that the underlying questions are 'hypothetical' and reflect women's perceptions about the appropriate role of women in society in general, not necessarily about their specific relationships or

personal experiences. This is interesting because Mishra et al. (2009) in their study found that the prevalence was highest for women in Cameroon who agreed that a woman was justified in asking a husband to use a condom if he has an STI. However, their study looked at the bivariate association between the individual indicators for attitudes toward sexual decision and wife beating and HIV status (see chapter 3 for details) while I created scales combining indicators for each measurement in the CDHS.

By contrast, a third scale that measured the actual degree of authority over household decisions was significantly related with HIV status (Table 4.5). On average women who were HIV positive were significantly more likely to be the main domestic decision makers in their respective households compared to women who were HIV negative. This result is similar to ones found by Mishra et al. (2009) as women with higher participation in household decision making had higher prevalence rates. This counter-intuitive finding is particularly interesting because the literature has argued that the more power a woman wields in her relationship, the more likely she will be able to negotiate safer sexually practices, thereby lowering her HIV risk. What the results may indicate is that having more household decision-making power does not necessarily translate to less risk of HIV in Cameroon. As discussed above, the apparent positive association between household ‘power’ and HIV could reflect the spurious impact of high SES (which is positively related both to riskier sexual behaviors and higher HIV rates in this sample).

Table 4.5. Power in Relationship by HIV Status

<i>Indicator</i>	Negative	Standard Deviation	Positive	Standard Deviation	<i>t</i>	<i>Significance (2-tailed)</i>
<i>Mean Score for Index Reflecting Household Decisions</i>	1.79	1.57	2.58	1.71	-8.45	<0.001
<i>N = 5,145</i>						
<i>Mean Score for Index Reflecting Attitudes Toward Sexual Decisions</i>	3.31	.961	3.38	.927	-1.61	>0.05
<i>N = 4547</i>						
<i>Mean Score for Index Reflecting Attitudes Toward Wife Beating</i>	1.53	1.65	1.56	1.61	-.349	>0.05
<i>N = 5,150</i>						

Sexual Behaviors of Respondent by HIV Status

In Cameroon, and in most areas of SSA HIV is mainly contracted through sexual contact between heterosexual partners. Thus the most proximate determinant of HIV status should be the level of risky or protective behaviors engaged in by the female respondents in the CDHS. Variables in the CDHS enabled me to operationalize two clusters of behavioral indicators: female protective sexual behaviors and female risky sexual behaviors.

Female Protective Sexual Behaviors

Female protective behavior is measured using three different variables which measure current, recent, and past condom use. As with other countries in Sub-Saharan Africa, rates of condom use are generally quite low in Cameroon, despite evidence from

literature that condoms can effectively reduce the risk of HIV infection. Somewhat surprisingly, results from the CDHS sample suggest that current use of condoms and condom use at last sexual intercourse were not significantly associated with a woman's HIV status (Table 4.6). What was even more unexpected was that women who reported ever using a condom at any point in their lives had higher rates of HIV infection (10 percent) compared to women who reported having never used a condom (5 percent). While use of a condom could not by itself increase HIV infections, these results suggest that the indicators of condom use in the CDHS may serve as a proxy for other factors or behaviors that increase the chances of HIV infection.

Table 4.6. Sexual Behavior (Protective) by HIV Status, Measured in Percentages

Table No. Sexual Behavior (Protective) by HIV Status, Measured in Percentages			
Indicator Variables	% of Women in CDHS	% HIV Positive	χ^2 , degrees of freedom, gamma or Cramer's V
Current Condom Use			
No	90.6	6.7	.67, 1, .011
Yes	9.4	7.7	
Ever Used Condom			
No	66.5	5.3	34.34***, 1, .082
Yes	33.5	9.7	
Used Condom at Last Intercourse			
No	88.7	6.5	.75, 1, .012
Yes	11.3	7.5	

*p<.05 **p<.01 ***p<.001

Female Risky Sexual Behaviors

As expected and shown on Table 4.7, risky sexual behavior on the part of a woman results in significantly higher rates of HIV infection, compared to women who did not practice these risky sexual behaviors. Consumption of alcohol at last sexual intercourse significantly increases the risk of HIV infection in women. Women who

drank alcohol had an HIV infection rate of 8 percent compared to women who did not drink at their last sexual intercourse (7 percent) and women who did not have sex in the last 12 months (4.8 percent). More poignant, however, is an apparent increase in rates of HIV infection when alcohol was consumed by only the respondent's partner (8.6 percent) and an even bigger increase when alcohol is consumed by both the respondent and her partner (10.4 percent). This might be indicative of the fact that inebriation may cloud the individuals' judgment thereby limiting their ability to use protective practices during sex.

Women whose first sexual intercourse occurs at a young age are generally assumed to be at higher risk of HIV (Clark, 2004), though Mishra et al. (2009) present evidence that it may be the reverse in certain countries. In Cameroon, the results shown on Table 4.7 suggest that women who initiated sex later actually had higher rates of HIV infection (7.6 versus 5.2 percent). On the other hand, women who reported being unfaithful to their spouses (i.e. had sexual intercourse with someone other than their husband) had higher HIV rates (11 percent) compared to women who did not (6 percent), indicating that infidelity is not only a significant determinant of HIV infection for males but also for women as well. Moreover, as expected having multiple partners in the year prior to the survey also increased the risk of HIV infection in women. Women who reported more than one sexual partner in the last 12 months had an 11 percent HIV infection rate compared to 6 percent for women who reported one or less sexual partners in the last 12 months (Table 4.7).

Table 4.7. Sexual Behavior (Risky) by HIV Status, Measured in Percentages

Table 4.7: Sexual Behavior (Risky) by HIV Status, Measured in Percentages			
Indicator Variables	% of Women in CDHS	% HIV Positive	χ^2 , degrees of freedom, gamma or Cramer's V
<i>Drank Alcohol at Last Sex</i>			
No Sex Last 12 Months	23.7	4.8	14.67**, 4, .053
Had Sex No Alcohol	61.5	7.0	
Respondent Only	1.0	8.0	
Partner Only	9.5	8.6	
Respondent and Partner	4.3	10.4	
<i>Early Sexual Exposure</i>			
1 st Exposure under 15	35.0	5.2	11.38***, 1, .047
1 st Exposure 15+	65.0	7.6	
<i>Married but Had Sex with Person Other than Husband</i>			
No	90.5	6.3	14.42***, 1, .053
Yes	9.5	10.9	
<i>More Than 1 Sexual Partner Last 12 Months</i>			
No	93.3	6.4	10.77***, 1, .046
Yes	6.7	11.0	
*p<.05 **p<.01 ***p<.001			

Overall, women who had more cumulative years of sexual exposure before marriage had higher rates of HIV, confirming that the longer the years between a woman's first sexual intercourse and first marriage, the higher the risk of being HIV infected (Table 4.8). On average women who were HIV positive were more likely to have experienced longer years of premarital sexual exposure (3.42 years), compared to women who were HIV negative (1.83 years). Interestingly, total years of sexual experience (regardless of marital status) were not significantly associated with a woman's HIV status. Finally, women who were HIV positive reported significantly more average numbers of sexual partners over the previous 12 months, confirming results presented

above and from other studies (Mishra et al., 2009) in which women with more than one sexual partner had higher rates of HIV infection.

Table 4.8. Sexual Behavior (Risky) by HIV Status

<i>Indicator</i>	Negative	Standard Deviation	Positive	Standard Deviation	<i>t</i>	<i>Significance (2-tailed)</i>
<i>Mean Score reflecting Years of Premarital Sexual Exposure</i>	1.83	3.34	3.42	4.82	-6.07	< 0.001
<i>N = 5,144</i>						
<i>Mean Score Reflecting Years of Sexual Exposure</i>	13.45	8.77	13.72	7.89	-.600	>0.05
<i>N = 4,944</i>						
<i>Mean Score Reflecting Total Sexual Partners last 12 Months</i>	0.85	0.778	1.03	1.20	-4.10	<0.001
<i>N = 5,136</i>						

Marital Status by HIV Status

Marital status is significantly related to a woman's HIV status (Table 4.9). HIV infection rates were significantly higher for women who were widowed (25.6 percent), divorced (21.4 percent), separated (13.3 percent), and cohabitating (11.7 percent). Meanwhile, women who had never been married or who were currently married had the lowest rates of HIV infection in the sample (3.5 and 4.8 percent, respectively). Similar results were obtained from other studies, including Cameroon (Mishra et al., 2009; Reither and Mumah, 2009). In Reither and Mumah (2009) we found that formerly married women had the highest HIV prevalence rate compared to women who were

currently married. It would appear that the loss of husband (or change in marital status) due to past HIV infections of married women and/or their partners' could be linked to current female HIV status.

Table 4.9. Marital Status by HIV Status, Measured in Percentages

Table 4.2: Marital Status by HIV Status, Measured in Percentages			
Indicator Variables	% of Women in CDHS	% HIV Positive	χ^2 , degrees of freedom, gamma or Cramer's V
<i>Marital Status</i>			
Not Married	22.7	3.5	178.83***, 5, 0.186
Currently Married	52.1	4.8	
Living Together	16.7	11.7	
Widowed	2.6	25.6	
Divorced	1.1	21.4	
Not Living Together	4.8	13.3	
<i>Age at first Marriage-Recode</i>			
Never Married	22.7	3.5	48.89***, 3, 0.097
Early Marriage under 16	37.6	6.1	
Middle Age Group 17-19	20.3	7.7	
Late Marriage 20+	19.3	10.9	
<i>Polygamous Marriage – Dummy</i>			
No	79.2	7.0	1.65, 1, 0.018
Yes	20.8	5.9	
<i>Formerly Married</i>			
No	91.5	5.7	96.22***, 1, 0.137
Yes	8.5	18.0	
*p<.05 **p<.01 ***p<.001			

*p<.05 **p<.01 ***p<.001

The age at which a woman first got married was also significantly associated with rates of HIV infection. Results from analysis show the later the age of first marriage, the higher the risk of HIV infection. Women who married after age 20 had the highest rates (10.9 percent) compared to women who married between age 17 and 19 (7.7 percent) and women who first married under age 16 (6.1 percent).

From the literature summarized in Chapter 2, we know that higher SES women in SSA are more likely to marry later or not marry at all, and this could help explain one of the pathways that high SES women are increase risk of HIV. For high SES women who therefore marry later (after age 20), compared to the other groups, what puts them at increased risk is the longer interval between their first sexual intercourse and first marriage (which we already know is significantly associated with higher rates of HIV infection). Surprisingly there was not a significant relationship between being in a polygamous marriage and HIV status.

Place of Residence and Age of Respondent

Aside from the influence of the core independent variables discussed above, my analysis seeks to control for the aggregate effects of place of residence and the age of the respondent. Table 4.10 demonstrates that there are significant differences in HIV rates across the ten administrative regions and two major cities in Cameroon. The Nord Ouest, Sud Ouest and Adamaoua regions have the highest rates (12, 11 and 10 percent, respectively) while the two major cities (Douala and Yaoundé) had rates between 8-10 percent. Intermediate regions such as Est, Sud and Littoral have high rates as well (9, 8 and 7 percent, respectively). The lowest rates of HIV infection are in regions of the Nord (1 percent), the Extreme Nord (2 percent) and the Ouest (3 percent). Meanwhile, residents of urban areas have higher rates of HIV infection (8.2 percent) compared to their counterparts in the rural areas (5.4 percent). When these regions are collapsed into 4 distinct cultural groups, only the ethnic groups from the Littoral/Sud Ouest and the Nord/Adamaoua/Extreme Nord showed a significant association with female HIV status.

It is likely that people living in regions or places with relatively high incidence of HIV among the local population will be at greater risk of contracting HIV, all other factors held constant. Conversely, the likelihood of contracting HIV from risky behaviors may be significantly lower in regions with relatively low background HIV rates.

Table 4.10. Control Variables by HIV Status, Measured in Percentages

<i>Indicator Variables</i>	<i>% of Women in CDHS</i>	<i>% HIV Positive</i>	<i>χ^2, degrees of freedom, gamma or Cramer's V</i>
<i>Region of Residence</i>			
<u>Group 1</u>			
Centre	8.9	5.9	
Sud	7.5	7.7	
Est	7.0	8.8	
<i>Combined</i>	23.5	7.3	0.837, 1, 0.013
<u>Group 2</u>			
Littoral	8.0	6.6	
Sud Ouest	7.5	11.1	
<i>Combined</i>	15.5	8.8	6.04*, 1, 0.034
<u>Group 3</u>			
Ouest	9.9	3.3	
Nord Ouest	8.2	11.8	
<i>Combined</i>	18.2	7.2	0.271, 1, 0.007
<u>Group 4</u>			
Nord	8.5	1.4	
Adamaoua	7.6	9.9	
Extrême Nord	9.6	2.0	
<i>Combined</i>	25.7	4.1	19.53***, 1, 0.062
<u>Major Cities</u>			
Douala	9.4	7.7	
Yaoundé	7.8	10.2	
			94.31***, 11, 0.135 (<i>all 10 regions and 2 cities combined</i>)
<i>Place of Residence</i>			
Urban	48.2	8.2	15.89***, 1, 0.056
Rural	51.8	5.4	

*p<.05 ***p<.001

There were also significant differences in HIV infection rates among respondents in different age groups. HIV rates rise with age until they peak among those aged 25-29 years old, then decline among the older cohorts. As will be discussed in chapter 5, because age was highly correlated with many other direct or proximate factors that can increase the risk of HIV infection, and because age itself cannot be seen as a direct cause of HIV risk, I chose not to include measures of respondent's age in my final multivariate models.

Table 4.10. (continued) Control Variables by HIV Status, Measured in Percentages

Percentages			
Indicator Variables	% of Women in CDHS	% HIV Positive	χ^2 , degrees of freedom, gamma or Cramer's V
<i>Respondent's Age – 5 Year Groups</i>			
15 – 19	24.8	2.1	75.42***, 6, 0.121
20 – 24	20.7	7.6	
25 – 29	16.5	10.8	
30 – 34	13.1	9.2	
35 – 39	10.1	7.9	
40 – 44	8.1	6.7	
45 – 49	6.7	5.2	
<i>Religious Affiliation</i>			
Catholic	38.1	7.3	19.17***, 3, 0.061
Protestant	35.4	7.9	
Muslim	16.9	5.2	
Other	9.6	3.0	

*p<.05 **p<.01 ***p<.001

There were also significant differences between the different religious groups in the CDHS. Protestant and Catholic women showed the highest HIV prevalence rate (7.9 and 7.3 percent, respectively), compared to HIV rates for Muslim women (5.2 percent) and women who reported other religious faith, including atheism (3.0 percent).

Relationships among Independent Variables

While the focus of my analysis is designed to explore the associations between independent variables and a respondent's HIV status, patterns of association among the various independent variables can also shed light on the possible causal pathways that put women at risk of contracting HIV. In particular, my primary interest in the role of socioeconomic status (SES) led me to explore ways in which SES is consistently related to the levels of other independent variables used to predict HIV.

Socioeconomic Status by Independent Variables

Relationship Between SES Variables

Because I have several distinct indicators to represent a woman's SES – including household wealth, respondent education, and respondent occupation -- I initially analyzed patterns among the different SES variables. Not surprisingly, household wealth and a woman's education are significantly and positively related ($\text{Gamma} = 0.659$). Women in the highest wealth category predominantly reported secondary or higher education (64 percent), while those in the lowest wealth households reported no education (38 percent) or only primary school (48 percent). Interestingly, the relationship between wealth and occupation is more complex than anticipated. On the one hand, women in high wealth households were most likely to report being unemployed (50 percent), with roughly a third working in manual/domestic jobs, 8 percent in agricultural jobs, and only 9 percent in professional/white collar jobs. The high rate of unemployment among the wealthiest women suggests that a woman's wealth is not solely a reflection of income from her

occupation, but also of her partners and/or family's household wealth. Meanwhile, women in low wealth households were mostly engaged in farming occupations, with an unemployment rate of 21 percent.

The results suggest an interesting relationship between educational attainment and the wealth and occupation of respondents (Table 4.11). The majority of women with secondary or higher levels of education lived in high wealth households, while only a few of the women with no education (11 percent) were in the high wealth group. Not surprisingly, the women with no education or only a primary level education were most likely to report working in the agricultural sector (54 percent and 45 percent, respectively).

Meanwhile, women with the most formal education (secondary education and higher education) had the highest rates of unemployment (49 percent and 58 percent, respectively) compared to women who had no education (32 percent) and women with a primary level education (29 percent). Even among the women with post-secondary education, only 14 percent reported current work as a professional or white-collar employee.

Finally, a comparison of the wealth and education status of women by occupation group (at the bottom of Table 4.11) suggests that unemployment status is not a very good indicator of low wealth or education. Most of the unemployed women in the sample have at least a secondary education and live in high wealth households. As expected, almost all women with professional or white collar jobs had higher degrees and lived in high wealth households. Agricultural workers typically had relatively low levels of education and lived in low or medium wealth households. The category of manual/domestic

workers is interesting since many of these workers had primary or secondary education and roughly equal proportions lived in households with different wealth endowments.

Table 4.11. Relationship between SES Variables, Measured in Percentages

SES	(%) Education				(%) Wealth			(%) Occupation			
	NE	PE	SE	HE	L	M	H	U	P/WC	AG	M/D
Wealth											
Low	38	48	13	0				21	.3	66	13
Medium	18	49	32	0.2				39	2	36	23
High	5	31	60	4				50	9	8	32
All	20	41	37	2				38	4.4	35	23
χ^2			1366.2***							1525.6***	
Gamma/Cramer's V			0.659***							-149***	
Education											
No Education					68	21	11	32	0.1	54	14
Primary					42	27	32	29	0.1	45	25
Secondary					12	19	68	49	9	15	28
Higher					0.0	2	98	58	14	1	8
All					35	22	43	38	4.4	35	23
χ^2						1366.2***				955.2***	
Gamma						0.659***				-0.143***	
Occupation											
Unemployed	17	32	48	3	21	39	50				
Prof/White Collar	.4	11	75	14	.3	2	9				
Ag Sector	31	53	16	.1	65	36	8				
Manual/Domestic	12	44	44	1	19	23	33				
All	20	41	37	2	35	22	43				
χ^2		.955.2***				1525.6***					
Gamma		-0.143***				-0.149***					

Note: L = Low; M=Medium; H=High; NE= No Education; PE= Primary Education; SE=Secondary Education; HE= Higher Education; U=Unemployed; AG=Ag Sector; M/D= Manual/Domestic; P/WC=Professional White Collar; χ^2 =Chi-Square

*** $p < .001$

Relationship Between Respondent's SES and Partner's SES

Partner's SES was generally positively related to a woman's SES as well (Table 4.12). Women from higher wealth households were most likely to have no partner (33 percent) than women in low or medium wealth households. When they had partners, high wealth women were more likely to have partners with secondary or post-secondary education (45 percent), and partners in professional/white collar occupations (33 percent). By contrast, women from low wealth households were least likely to be unattached, and their partners predominantly had low levels of education and worked in agricultural occupations.

Meanwhile, women with secondary and post secondary education were more likely to be either unattached or in a relationship with men that had professional/white collar jobs (30 percent and 37 percent, respectively). Most women with low education were in a relationship with a partner who had low education and worked in agricultural occupations, though a small fraction (10 percent) reported having a professional/white collar partner.

Finally, a sizeable fraction of women who were unemployed (42 percent) were not in a relationship, while most women with professional/white collar jobs had highly educated partners with professional occupations. Women working in the farm sector had partners with low levels of formal education who predominantly also worked in farming. As before, women working as manual/domestic workers were a diverse group – with a sizeable fraction unattached, and the remaining partners distributed across nearly all of

the education and occupational categories.

Table 4.12. Respondent's Socioeconomic Status by Partner's SES, Measured in Percentages

Respondent's SES	(%) Partner's Education						(%) Partner's Occupation				
	NP	NE	PE	SE	HE	DK	NP	UP	AG	P/WC	M/D
Wealth											
Low	13	31	32	18	0.4	6	13	1	62	9	14
Medium	20	14	27	31	0.2	6	20	2	35	20	23
High	32	4	15	35	10	4	33	3	7	33	24
All	23	16	23	28	5	5	23	2	33	21	21
χ^2	1058.6***						1434.1***				
Gamma	0.100***						-0.269***				
Education											
No Education	5	62	22	5	.2	6	5	.4	67	10	18
Primary	19	18	36	30	1	6	19	1	37	19	24
Secondary	35	8	11	40	9	4	36	4	11	30	19
Higher	47	0	0	13	41	0	47	5	1	37	10
All	23	16	23	28	5	5	23	2	21	33	21
χ^2	3071***						1192.9***				
Gamma	0.165***						-0.374***				
Occupation											
Unemployed	42	13	13	23	5	3	43	3	17	20	19
Prof/White Collar	13	1	9	45	29	3	14	2	6	62	17
Ag Sector	8	24	37	25	1	6	8	1	67	11	13
Manual/ Domestic	16	11	22	38	7	6	16	2	15	32	35
All	23	16	23	28	5	5	23	2	21	33	21
χ^2	1349.7***						2042.7***				
Crammer's V	0.296***						0.366***				

Note: NP=No partner; NE= No Education; PE= Primary Education; SE=Secondary Education; HE= Higher Education; DK=Don't Know; UP=Unemployed Partner; AG=Ag Sector; M/D= Manual/Domestic; P/WC=Professional White Collar; χ^2 =Chi-Square

*** $p < .001$

Relationship between SES and Access to Health Care

Overall, as reported elsewhere in the literature, there was a positive and highly significant association between SES and access to health care (Table 4.13). Wealthier and more educated women were more likely to have visited a health facility in the last 12

months (57 and 66 percent, respectively), and to have heard of and visited a

Voluntary Counseling and Testing Center (5 and 8 percent, respectively).

Table 4.13. Relationship between Access to Health Care and SES Variables, Measured in Percentages

		% Access CPDV			% Visited Health Facility	Barriers			
Respondent's SES	NH	H	B	% Yes	0	1	2	3	
Wealth									
Low	91	9	1	47	39	12	33	16	
Medium	81	17	2	51	52	14	26	8	
High	57	38	5	57	65	16	15	5	
All	74	23	3	53	53	14	24	10	
χ^2	618.4***			35.3***	407.3***				
Gamma	0.609***			0.136***	-0.357***				
Education									
No Education	97	3	1	44	41	11	26	22	
Primary	84	14	2	52	52	14	26	8	
Secondary	54	41	5	57	59	15	21	5	
Higher	26	67	8	66	65	15	17	3	
All	74	23	3	53	53	14	24	10	
χ^2	909.9***			48.8***	273.4***				
Gamma	0.713***			0.156***	-0.235***				
Occupation									
Unemployed	71	26	3	47	57	15	20	9	
Prof/White Collar	30	56	14	72	66	16	15	3	
Ag Sector	88	11	1	52	43	12	31	13	
Manual/ Domestic	68	28	4	58	59	15	20	7	
All	74	23	3	53	53	14	24	10	
χ^2	472.3***			71.3***	175.1***				
Cramer's V	0.214***			0.118***	0.107***				

Note: NH=Not Heard; H=Heard but not Been; B=Been: χ^2 = Chi Square

*** $p < .001$

Higher SES women were also significantly less likely to report barriers to accessing health care. In fact each increase in a woman's educational attainment was associated with a decrease in the number reporting barriers to health care, with just 5 percent of women with a secondary education and 3 percent of women with higher education report facing all three barriers to accessing health care (compared to 16-22

percent of women with no formal education or in low wealth households). Same pattern is seen with wealth as wealthier women were less likely to report facing any significant barriers to health care.

Access to health care also varied by the different occupational categories. Women in professional or white collar professions were more likely to report visiting a CPDV (14 percent), more likely to have accessed a health facility within the last year, and faced the fewest barriers to health care of any occupational group.

Relationship Between SES and Knowledge of HIV Prevention Methods

There is a significant positive association between a respondent's SES and their level of knowledge about HIV prevention methods (Table 4.14). Higher levels of wealth and educational attainment were associated with a systematic increase in respondents' mean scores on the HIV knowledge index. Women with secondary and post-secondary education had scores that were almost double that of women with no formal education. A woman's occupation was also significantly associated with knowledge of HIV prevention methods. Women in professional/white collar professions commanded the highest mean knowledge score (9 out of 15), with women in agricultural professions reporting the lowest scores (6.3). Women who were unemployed or in the manual/domestic professions had similar and intermediate mean knowledge scores (7.4 and 7.6, respectively).

Table 4.14. Relationship between Knowledge of HIV Prevention Methods and SES Variables.

Respondent's SES	Index Scale Reflecting Knowledge of HIV & HIV Prevention Methods		
	Mean Knowledge Score	<i>F</i>	<i>p</i> -value
Wealth			
Low	5.89	424.2	<i>p</i> <.001
Medium	6.97		
High	8.18		
Total	15		
Education			
No Education	4.87	681	<i>p</i> <.001
Primary	6.80		
Secondary	8.51		
Higher	9.29		
Total	15		
Occupation			
Unemployed	7.37	159	<i>p</i> <.001
Prof/White Collar	9.01		
Ag Sector	6.26		
Manual/ Domestic	7.56		
Total	15		

Relationship Between SES and Power in Relationships

There was a significant and expected positive association between most measures of SES and various indicators of the degree of power within intimate relationships by female respondents (Table 4.15). As discussed in Chapter 3, the CDHS data enabled me to calculate three different indices that reflect decision making authority within the household, attitudes toward sexual decision-making, and attitudes toward wife-beating.

Household Decision: Wealth was positively associated with the amount of decision-making authority a woman wielded in her household. Women in the highest wealth quintile had the highest score on a domestic decision-making index (averaging 2

Table 4.15. Relationship between Power in Relationship and SES Variables

Respondent's SES	Index Scale Reflecting Domestic Decision Making	Index Scale Reflecting Attitudes Toward Sexual Decisions	Index Reflecting Attitudes Toward Wife Beating
Wealth			
Low	1.69	3.23	1.87
Medium	1.84	3.24	1.67
High	1.97	3.41	1.16
All	1.84	3.30	1.53
<i>F</i>	15.56	20.14	99.53
Significance	$p<.001$	$p<.001$	$p<.001$
Education			
No Education	1.50	3.06	1.96
Primary	1.95	3.30	1.70
Secondary	1.84	3.45	1.17
Higher	2.82	3.56	0.28
All	1.84	3.30	1.53
<i>F</i>	30.7	35.94	83.74
Significance	$p<.001$	$p<.001$	$p<.001$
Occupation			
Unemployed	1.11	3.29	1.41
Prof/White Collar	2.09	3.48	0.58
Ag Sector	2.36	3.26	1.78
Manual/ Domestic	3.31	3.35	1.53
All	1.84	3.30	1.53
<i>F</i>	299	4.78	42.25
Significance	$p<.001$	$p<.01$	$p<.001$

out of 5) compared to the women in the medium (1.8) and low wealth households (1.7). Worthy of note, however, is that the only significant difference as indicated by post hoc tests, was between women in high wealth index and low wealth index. The relationship between a woman's educational attainment and her domestic decision-making authority was somewhat more complicated. As expected, women with post-secondary education had the highest score (2.8), and women with no education had the lowest score (1.5). However, women with secondary education had a slightly lower mean score (1.8) compared to women with primary level education (1.9). Post-hoc tests suggest that the

differences between these two intermediate groups were not statistically meaningful.

Finally, decision-making authority was significantly associated with a respondent's occupation. Women in professional/white collar professions commanded the highest average decision-making authority (3.3) compared to the other professions, with unemployed women reporting particularly low levels of authority.

Power over sexual decisions: There was a general positive and significant association between a woman's SES and her attitudes toward sexual decision-making power, though the absolute value of these differences was less dramatic. Women in high wealth households identified more situations in which a wife would be justified in refusing to have sex with her husband (*with a mean score of 3.4*) compared to women in medium (3.2) and low wealth households (3.2), though difference between low and medium was not significant. The relationship between education and perceived power over sexual decisions was as expected, with increases in formal education associated with an increasing sense of why women can be justified in refusing sex to their spouses. Occupation was also linked to attitudes toward sexual decisions. Women in agriculture sector expressed the lowest sense of power (3.2), while women in professional/white collar (3.5) and women in manual/domestic (3.4) jobs had higher scores on this measure. Unemployed women had mean scores that were higher than those of women in agriculture, but post hoc test revealed no significant differences between these two groups.

Attitude toward physical violence: On average, high SES women were less likely to think wife beating was justified compared to women in lower SES groups. Specifically, women in high wealth households, with post-secondary education, and in

professional/white collar professions had significantly lower scale scores than the other groups (reflecting their lower levels of agreement that wife beating was justified under various hypothetical scenarios). Conversely, women in low wealth households, those with no formal education, and those who work in agriculture were the most likely to think wife beating could be justified.

Relationship Between SES and Protective Sexual Behavior

Protective sexual behavior measured in terms of condom use by women in the CDHS was significantly and positively associated with a woman's SES (Table 4.16). Specifically, women in high wealth households, with secondary or post-secondary education, and with professional/white collar jobs report dramatically higher rates of past and present condom use than women in the other SES groups. By contrast, condom use among women with no formal education or living in low wealth households was almost non-existent.

Groups with intermediate wealth, education, or occupational status report moderate rates of condom use. Overall, however, though rates of condom use were significantly different by SES, they remain generally quite low among Cameroonian women. Even among the high SES women, rates of current condom use and condom use during their last sexual experience ranged between 15-35 percent, suggesting that a majority of these women were not using condoms on a regular basis.

Table 4.16. Relationship between Protective Sexual Behaviors and SES Variables, Measured in Percentages

Respondent's SES	Protective Sexual Behaviors		
	CONDOMEVER (yes)	CURRENTCONDOM (yes)	CONDOMLASTSEX (yes)
Wealth			
Low	15	2.8	4.4
Medium	32	6.2	9.1
High	49	16.6	18.2
All	34.5	9.4	11.3
χ^2	509.9***	240.8***	191.7***
Gamma	0.531***	0.616***	0.513***
Education			
No Education	1.6	0.1	0.9
Primary	27.5	5.8	8.0
Secondary	55.4	16.9	19.4
Higher	66.3	35.4	33.3
All	33.5	9.4	11.3
χ^2	956.9***	339.3***	298.5***
Gamma	0.711***	0.693***	0.621***
Occupation			
Unemployed	36.8	12.9	14.8
Prof/White Collar	68.2	20.5	20.2
Ag Sector	18.5	2.7	4.2
Manual/ Domestic	43.8	11.5	14.4
All	33.5	9.4	11.3
χ^2	365.9***	161.9***	140.7***
Cramer's V	0.267***	0.178***	0.167***

Note: CONDOMEVER=Ever used condom; CURRENTCONDOM=Current condom use; CONDOMLASTSEX=Condom use at last sexual intercourse; χ^2 = Chi Square

*** $p < .001$

Relationship Between SES and Risky Sexual Behavior

A woman's SES was also significantly associated with both risky and protective sexual behaviors, though the pattern was not consistent across different measures (Table 4.17). Women in higher wealth households reported less alcohol use at last sexual intercourse and were less likely to initiate sexual activity before the age of 15 (both

considered risky behaviors). However, wealthier women were the most likely to report sex with a partner other than their husband, and to have had more than 1 sexual partner over the previous year. Conversely, women in low wealth households were most likely to have used alcohol and to have had early sexual experiences, but were less likely to report infidelity or multiple partners. Women in medium wealth households had rates of risky behavior between the other two groups, but were consistently closer to the 'high risk' group on each of the four measures.

With regards to education, the pattern was much more complicated. Women with post-secondary education were least likely to have used alcohol during sex or to have initiated sexual activity at a young age, but were near the top (behind those with secondary education) among the education groups in terms of measures of infidelity. Women with no formal education had very low rates of infidelity or multiple partners, but were the most likely education group to have initiated sexual activity before the age of 15. In fact any increase in educational attainment saw a decrease in the rate of women initiating sexual intercourse under age 15. Compared to all other groups however, women with either primary or secondary education generally reported the highest rates of risky behaviors. In all, women with secondary education were more likely to practice riskier sexual practices than any other group and could in part explain why they have the highest rates of HIV.

Table 4.17. Relationship between Risky Sexual Behaviors and SES Variables, Measured in Percentages

SES	Risky Sexual Behaviors			
	DRKL (any)	MSMOTH (yes)	ESE (under 15)	SPL12M (yes)
Wealth				
Low	16	5.0	41	4.4
Medium	15	10.7	36	7.0
High	14	12.6	30	8.5
All	15	9.5	35	6.7
χ^2	16.02**	68.17***	53.81***	26.83***
Gamma	-.083***	.313***	-.176***	.240***
Education				
No Education	11.6	1.0	45.0	0.4
Primary	16.6	9.1	36.2	7.2
Secondary	14.8	14.4	28.9	9.4
Higher	7.3	11.5	16.8	8.3
All	14.3	9.5	35	6.7
χ^2	59.26***	138.46***	95.63***	87.22***
Gamma	-.059**	.455***	-.228***	.400***
Occupation				
Unemployed	9	9.6	43.8	6.9
Prof/White Collar	19	17.1	9.4	9.0
Ag Sector	19	5.2	33.3	4.4
Manual/ Domestic	17	14.5	27.9	9.2
All	15	9.5	35.0	6.7
χ^2	237.7***	86.9***	158.8***	28.62***
Cramer's V	.152***	.130***	.176***	.075***

Note: DRKL=Drank alcohol at last sexual Intercourse; MSMOTH=Married but had sex with person other than husband; ESE=Early sexual exposure; SPL12M=More than one sexual partner in the last 12 months; SES=Socioeconomic Status; χ^2 = Chi Square

** $p < .01$ *** $p < .001$

A similarly complex story can be told of the relationship between occupation and the incidence of risky sexual practices (Table 4.17). The relationship between drinking alcohol and sex was most prevalent among agricultural workers and professional/white collar occupations, while unemployed women were the least likely to report this behavior. Meanwhile, unemployed women were the most likely to report early sexual

activity (followed closely by agricultural workers), a behavior that was quite rare among professional/white collar workers. Women working in the agricultural sector were least likely to report infidelity or multiple partners, followed closely by unemployed women. By contrast, both professional workers and manual/domestic workers had notably higher rates of these practices.

A different measure of risky behavior is the total number of years of premarital sex reported by women in the CDHS. As expected, SES was strongly and significantly associated with the number of years between a woman's first sexual intercourse and first marriage (Table 4.18). The higher a woman's SES, the longer the years of premarital

Table 4.18. Relationship Between Risky Sexual Behaviors and SES Variables.

Years of Premarital Sexual Exposure (YSE)			
Respondent's SES	Mean YSE Score	<i>F</i>	<i>p</i> -value
Wealth			
Low	1.33	46.37	<i>p</i> <.001
Medium	2.03		
High	2.38		
Total	29		
Education			
No Education	0.51	89.4	<i>p</i> <.001
Primary	1.97		
Secondary	2.53		
Higher	4.37		
Total	29		
Occupation			
Unemployed	1.56	33.9	<i>p</i> <.001
Prof/White Collar	4.19		
Ag Sector	1.79		
Manual/ Domestic	2.29		
Total	29		

sexual exposure she had. Whether measured by wealth, education, and occupation, high SES women reported consistently greater gaps between their initiation of sexual activity and their first marriage. This is even more striking when we recall (from Table 4.17 above) that these same groups tended to have lower rates of sexual activity at a young age, suggesting that delayed marriage is the main reason for differences in premarital sexual exposure.

Relationship between SES and Marital Status

SES variables were significantly related to all of my measures of marital status. Initially, the probability that a woman will never be married increased with wealth and education (Table 4.19). Women in the high wealth index (32 percent) and with post secondary education (47 percent) had the highest rates of having never married compared to all the other groups. Unemployed women were also more likely to have never been married (42 percent) compared to the other professions. However, considering that a high percentage of women who were unemployed also reported being in high wealth households, this result is not so surprising.

Women living in low wealth households (68 percent), those with no education (85 percent), and those working in the agricultural sector (72 percent) were the most likely to report being currently married. Conversely, women in high SES groups were more likely to be cohabiting than women in low SES categories. Rates of former marriages (divorce, widowed, or separated) were generally low for every group. However, the percentage of women who had lost a spouse (widowed) was highest for women with no education (4 percent), in medium wealth households (4 percent) and among women in the agriculture

Table 4.19. Relationship between Marital Status and SES Variables, Measured in Percentages

Percentages		Marital Status					
SES	Never Married	Married	Living Together	Widowed	Divorced	Separated	%Total
<i>Wealth</i>							
Low	13.4	68.0	11.0	3.0	1.0	4.0	35
Medium	20.0	51.0	19.0	4.0	1.0	5.0	22
High	32.0	18.0	20.0	2.0	1.0	6.0	43
χ^2			371.5***				
Gamma			-.085***				
<i>Education</i>							
No Education	5.0	85.0	1.0	4.0	2.0	2.0	20
Primary	20.0	55.0	18.0	3.0	0.8	5.0	41
Secondary	35.0	32.0	24.0	2.0	0.8	7.0	37
Higher	47.0	35.0	13.0	0.0	0.0	5.0	2
χ^2			947.9***				
Crammer's V			.248***				
<i>Occupation</i>							
Unemployed	42.0	35.0	17.0	2.0	1.0	1.0	37.5
P/WC	13.0	51.0	19.0	4.0	1.0	11	4.4
Ag Sector	7.0	72.0	13.0	4.0	1.0	4.0	34.8
M/D	16.0	50.0	23.0	3.0	2.0	7.0	23.4
χ^2			889.2***				
Cramer's V			.240***				

Note: M/D=Manual/Domestic; P/WC=Professional/White Collar; χ^2 = Chi Square

*** $p < .001$

sector. While it is speculative, it is possible that spousal death due to HIV is lower for higher SES individuals due to greater access to and ability to afford treatment.

Meanwhile, age at first marriage generally increased with wealth and education. Women with post-secondary education were more likely to marry after age 20 (43 percent) compared to women with no education (7 percent). Women in the high wealth index were also more likely to marry after age 20 (25 percent) compared to women

Table 4.20. Relationship between Marital Status and SES Variables, Measured in Percentages

Respondent's SES	Age at First Marriage				Polygamous Marriage
	NM	<16	17-19	>20	% Yes
Wealth					
Low	13.0	54.0	19.0	14.0	29.1
Medium	20.0	39.0	22.0	18.0	22.6
High	32.0	23.0	20.0	25.0	12.9
All	22.7	37.6	20.3	19.3	20.8
χ^2		465.8***			160.7***
Gamma		-.003			-.350***
Education					
No Education	5.2	71.7	16.6	6.5	42.0
Primary	18.8	40.6	22.7	17.9	20.8
Secondary	35.2	18.0	20.4	26.5	10.4
Higher	46.9	2.1	8.3	42.7	3.2
All	22.7	37.6	20.3	19.3	20.8
χ^2		1044.9***			422.4***
Cramer's V	.260***				.287***
Occupation					
Unemployed	42.3	28.8	15.0	13.8	12.5
P/WC	13.4	14.3	21.9	50.4	14.7
Ag Sector	7.4	50.9	23.3	18.3	31.4
M/D	15.7	36.4	24.1	23.7	19.7
All	22.7	37.6	20.3	19.3	20.8
χ^2		897.8***			205.5***
Cramer's V	.241***				.200***

Note: NM=Never married; M/D=Manual/Domestic; P/WC=Professional/White Collar; χ^2 =Chi Square

*** $p < .001$

in low wealth index (14 percent). On the other hand, women in the agricultural sector were much more likely to marry under age 16 (51 percent) compared to women in professional/white collar jobs (14 percent) or unemployed women (29 percent). These results confirm recent literature that indicates higher SES women tend to delay marriage compared to other groups.

The relationship between polygamous marriage and SES was also consistent with research expectations as women in low wealth households were more likely than the other SES groups to be in a polygamous union. Overall, 29 percent of low wealth women, 42 percent of women with no education, and 31 percent of agricultural workers are living in polygamous households.

Relationship Between SES and Control Variables

Consistent with research expectations, the relationship between a respondent's place of residence and their SES was generally significant. The overwhelming majority of women living in high wealth households, with secondary or post-secondary education, and who work in professional white/collar jobs lived in urban areas (where HIV rates are relatively high). Meanwhile, the majority of women in both low and medium wealth households, those with no education or only primary-level education, and those working in the agricultural sector were living in rural areas (where the background HIV rates are comparatively low). Interestingly, the majority of women who were unemployed (62 percent) or who worked as manual/domestic workers (67 percent) also lived in urban areas.

Table 4.21. Relationship between Control Variables and SES, Measured in Percentages

Respondent's SES	Place of Residence	
	Urban	Rural
Wealth		
Low	12.0	88.0
Medium	34.9	65.1
High	85.1	14.9
Total	48.2	51.8
χ^2	2224.8***	
Gamma	-0.864***	
Education		
No Education	24.5	75.5
Primary	39.6	60.4
Secondary	68.4	31.6
Higher	83.3	16.7
Total	48.2	51.8
χ^2	651.9***	
Cramer's V	356***	
Occupation		
Unemployed	61.9	38.1
Prof/White Collar	81.7	18.3
Ag Sector	15.9	84.1
Manual/ Domestic	67.4	35.6
Total	48.2	51.8
χ^2	1170.1***	
Cramer's V	477***	
Note: χ^2 = Chi Square		
*** $p <.001$		

Relationship Between Sexual Behaviors, Access to Health Care, and Knowledge of HIV Prevention Methods

The relationship between access to health care and sexual behavior was generally positive, interestingly, women who accessed a health facility in the previous twelve months had higher rates of past and current condom use. However, the only significant relationship was ever use of a condom, while the other two condom use showed different but non-significant associations. Similarly, women who had accessed a CPDV in the last

twelve months also had higher rates of past and current condom use, compared to women did not access a CPDV (see Table 4.22). In all, access to health care was associated with increased protective sexual behavior. Counterintuitive, however, is the fact that these women were also more likely to practice risky sexual behaviors. Specifically, women who had accessed a health clinic in the last twelve months were also more likely to consume alcohol at their last sexual intercourse, or be unfaithful to their partners. The protective effect of condom use is therefore offset by the higher rate of infidelity and alcohol consumption, all known behaviors that increase HIV infection. There were no significant differences in rates of risky sexual behaviors between women who had visited a CPDV.

As expected, protective sexual behaviors was significantly positively associated with the amount of knowledge of HIV prevention methods a woman commanded. Women who scored 5 (out of 15) and below on the knowledge scale had the lowest rates of past and current condom use. On the other hand, women who scored 10 and above on the knowledge scale had higher rates of both current and past condom use. As with access to health care, women who scored higher on the knowledge scale also had higher rates of risky sexual behavior. Specifically, women higher on the scale had higher rates of infidelity as well as higher rates of multiple partners in the last twelve months.

Summary

In this chapter I have presented the findings from my bivariate analysis which overall indicate that the relationships between women, their socioeconomic status and HIV are complex. It is worth noting that a lot the results reported in this bivariate section

Table 4.22. Relationship Between Access to Health Care, Knowledge, and Sexual Behaviors

		Percent Reporting Behavior				
		Protective Behaviors			Risky Behaviors	
		Condom Use Ever	Condom Use Last Sex	Condom Use Currently	Alcohol Last Sex	Multiple Partners
Visited Health Clinic						
	NO	25.3	10.8	47.5	12.9	8.2
	YES	41.0	11.8	52.5	16.5	10.7
	X ²	141.43***	1.124	.730	84.24***	9.603**
	Cramer's V	.166***	.015	.012	.128***	.043**
Visited CPDV Clinic						
	NO	32.8	9.1	11.1	14.8	9.4
	YES	57.4	20.8	18.3	15.8	11.7
	X ²	39.12***	7.06**	23.37***	1.72	.873
	Cramer's V	.087***	.037**	.067***	.018	.013
Score on HIV Knowledge Index						
	Under 5	7.9	2.5	1.4	11.8	3.7
	5-6	19.6	7.0	4.9	14.7	7.3
	7	28.4	8.8	6.4	14.2	10.0
	8	42.4	14.5	11.3	17.4	10.7
	9	45.7	14.1	12.5	14.8	11.7
	10 and up	53.3	19.7	18.6	15.3	13.4
	X ²	572.45***	157.33**	187.76***	15.46	60.02***
	Gama	.335***	.370**	.191***	.042*	.242***
*p<.05		**p<.01	***p<.001			

are quite similar to results reported in other studies using the CDHS (Mishra et al., 2007a; Mishra et al., 2009; Reither and Mumah, 2009). In Reither and Mumah (2009) for example we do find that education was positively related to a woman's HIV status, though this relationship is significantly diminished when other control variables are added during the multivariate stage. Similarly, in Mishra et al. (2007a), women in the highest wealth index or with more knowledge of HIV had higher prevalence of HIV infection. All of these studies (especially Reither and Mumah, 2009) illustrate how cross-sectional bivariate patterns can and do disguise deeper causal pathways that put

women at increased risk of HIV infection. Some of the findings make logical sense (such as the positive correlation between risky sexual practices and HIV rates). In other cases, the observed bivariate patterns were more surprising (such as the observation that higher levels of knowledge about HIV are associated with higher HIV rates. Some of these surprising results may reflect spurious associations and/or ‘reverse causality’ – e.g., where women who have already contracted HIV may develop better knowledge of the disease, be more inclined to use condoms, and/or be more likely to visit health care facilities.

Other counter intuitive findings may reflect larger socio-cultural processes that place high SES women in SSA at greater risk of exposure to HIV. For example, the literature argues that the more power a woman wields in her relationship, the more likely she will be able to negotiate safer sexually practices, thereby lowering her HIV risk. But the Cameroonian results suggest that having more decision power doesn’t necessarily translate to less risk of HIV for higher SES women. It is possible that the unexpected positive relationship between ‘power’ and HIV really reflect the spurious effects of a third common variable associated with socioeconomic status (perhaps culturally-driven riskier sexual behaviors among high SES males and females). Taken as a whole, the CDHS suggests that Cameroonian women who are more educated, wealthier and in professional white collar jobs are most at risk for HIV, despite the fact that other characteristics of higher SES women (such as knowing how to protect themselves from HIV, greater access to preventative health care facilities, and greater condom use) should have protected them from infection.

Ultimately, the bivariate association between SES and HIV (and between SES and other proximate determinants of HIV) are interrelated and likely to be mediated by other factors including marital status, region and age (Reither and Mumah, 2009), and that is why more complex multivariate models are required to elucidate the causal pathways that put high (vs. low) SES women at risk. As an extension of that previous research, this following chapter estimates a series of logistic regression models for Cameroonian women in the CDHS sample to explore these complex relationships in more detail, but however, stratify by SES in an attempt to elucidate the specific pathway that increases risk of HIV for women in Cameroon.

CHAPTER 5

MULTIVARIATE ANALYSES

Introduction

Analyses in Chapter 4 detailed the bivariate relationships among my different independent variables and a woman's HIV status. The results described patterns that often were not consistent with theoretical expectations or previous studies and may be masking some more complex casual pathways that put Cameroonian women at increased risk of HIV. As discussed in Chapter 2, we are faced with an apparent paradox in which low SES is associated with limited access to health care, lower awareness of HIV, greater economic and cultural dependencies, all of which should put low SES women at increased risk. Nevertheless, gains in economic and cultural independence (associated with rising education and income) thus far have failed to shield wealthier women from increased risk. To address this puzzle, I now examine whether the mechanisms that put women at increased risk of HIV in Cameroon differ by socioeconomic status (SES).

To be able to adequately answer this question, multivariate modeling approaches are required to capture the influence of each causal variable net of the effect of the other important variables. In this chapter, I estimate a series of binary logistic regression models to assess the influence of a range of potential factors associated with the likelihood that a woman will be HIV positive. Guided by theory and the availability of appropriate indicators in the Cameroon DHS survey, I specifically examine the impact of respondent SES, partner SES, access to health care, knowledge of HIV prevention

methods, household decision-making power, risky and protective sexual behaviors, marital status, religion, and place of residence.

Taking into consideration the results from my bivariate analyses and from the extensive literature review done for this study, I developed a set of specific multivariate hypotheses or research expectations that guided me during my estimation of multivariate models. Initially, although women of both high and low SES are at increased risk of HIV, **I expect there to be different mechanisms that will put the different sub groups of women (low vs. high SES) at direct risks of HIV exposure.** Put differently, I expect that traditional socio-demographic variables used in most epidemiologic studies will be more important in explaining variation in HIV risk among low SES women. Among high SES women, by contrast, I expect culturally-determined norms and behaviors related to dating and marriage (which is linked to high SES) will be more significant predictors of HIV risk. Specifically;

***H3a.** For low SES women, I expect that traditional determinants such as limited access to health facilities, lower knowledge of HIV and HIV prevention methods, limited power within relationships, and early sexual exposure would be strong predictors of their risk of HIV. On the other hand, factors such as early marriage and being currently in monogamous relationships should provide more of a protective effect.*

***H3b.** For high SES women, I expect that delayed marriage, having multiple partners (infidelity), longer years of premarital sexual exposure and partner's SES will be a significant driver in predicting HIV risk for this group of women, but that traditional determinants will provide less explanatory power.*

Methods

In the construction of my logistic regression models, indicators for each major category of potential influence were used to predict a woman's HIV status. Table 5.1 provides basic descriptive statistics for indicators used in all models reported in this chapter. It is worth noting 258 respondents in the DHS sample were missing at least one of the core variables used in the models below; as a result all tables in this chapter use data from the 4,891 remaining cases with complete information.

Initially, I used three variables to capture the socioeconomic status of each respondent: highest level of education completed, current occupation, and household wealth. In each case, categorical variables were used to capture SES and a series of binary (0, 1) dummy variables were created to capture each category within the variables. The descriptive statistics (Table 5.1) suggest that roughly 20 percent of the respondents were without formal education, 40 percent had only primary education, and 40 percent were in the secondary education or higher class. Roughly 35 percent of the women in the sample worked in agriculture, 23 percent worked as manual or domestic workers, 4 percent had professional or white collar jobs, and 40 percent reported themselves as currently unemployed. Finally, 36 percent of women came from low SES households, 22 percent from medium SES households, and 42 percent were categorized by the DHS survey as high SES. To avoid saturating the models, a reference category was identified for each variable and was not included in model estimations. The resulting estimated model coefficients reflect the net effect of each measured value compared to the reference group.

Table 5.1: Descriptive Statistics for Variables Used in Multivariate Models

VARIABLE NAMES	VALUES (MIN/MAX)	MEAN	STD DEV
Respondent Socioeconomic Status			
<u>Respondent's Education</u>			
No formal education (reference)	0,1	0.199	0.400
Primary Education	0,1	0.414	0.493
Secondary Education or Higher	0,1	0.387	0.487
<u>Respondent's Occupation</u>			
Agriculture (reference)	0,1	0.349	0.487
Unemployed	0,1	0.376	0.484
Manual or Domestic	0,1	0.233	0.422
Professional/White Collar	0,1	0.043	0.203
<u>Respondent's Wealth Category</u>			
Low (reference)	0,1	0.358	0.479
Medium	0,1	0.223	0.417
High	0,1	0.419	0.493
Partner's Characteristics			
<u>Partner's Education</u>			
No formal Education (reference)	0,1	0.159	0.366
Primary Education	0,1	0.234	0.423
Secondary Education or Higher	0,1	0.327	0.469
<u>Partner's Occupation</u>			
Agriculture (reference)	0,1	0.329	0.470
Unemployed	0,1	0.021	0.142
Professional/White Collar	0,1	0.213	0.409
Manual or Domestic	0,1	0.205	0.404
Access to Health Care			
Visited a Voluntary Counseling & testing Center	0,1	0.027	0.163
Visited a Health Facility in the Last 12 Months	0,1	0.521	0.500
Any barriers to Medical Help	0,1	0.475	0.499
Knowledge of HIV Prevention Method			
Index Scale of Positive Indicators of HIV	0,15	7.086	2.633
Power in Relationships			
Scale for Domestic Decision Authority	0,5	1.823	1.593
Scale reflecting Attitudes toward Wife Beating	0,5	1.530	1.651

**Table 5.1: Descriptive Statistics for Variables Used in Multivariate Models
(continued)**

VARIABLE NAMES	VALUES(MIN/MAX)	MEAN	STD DEV
Sexual Behavior			
<u>Protective Behavior</u>			
Used Condom at Last Sexual Intercourse	0,1	0.111	0.314
No Sexual Intercourse Last 12 Months	0,1	0.238	0.426
<u>Risky Behavior</u>			
Years of Premarital Sexual Exposure	0,29	1.915	3.464
Sex with Person Other than Partner	0,1	0.092	0.288
More than 1 Sexual Partner in the Last 12 Months	0,1	0.066	0.247
Marital Status			
Currently Married (reference)	0,1	0.232	0.422
Never Married	0,1	0.522	0.500
Currently Cohabiting	0,1	0.162	0.369
Formerly Married	0,1	0.084	0.277
Married 16 & Under	0,1	0.374	0.484
Polygamous Marriage	0,1	0.208	0.406
Control Variables			
<u>Religion</u>			
Catholic (reference)	0,1	0.379	0.485
Protestant	0,1	0.354	0.478
Muslim	0,1	0.171	0.377
Other	0,1	0.096	0.295
<u>Place of Residence</u>			
Rural Residence	0,1	0.526	0.499
<u>Region</u>			
Region HIV	1.1,11.5	6.809	3.345
Centre/Sud/Est (reference)	0,1	0.237	0.425
Littoral/Sud Ouest	0,1	0.150	0.357
Ouest/Nord Ouest	0,1	0.186	0.389
Nord/Adamaoua/Extreme Nord	0,1	0.259	0.438
Yaoundé	0,1	0.077	0.266
Douala	0,1	0.092	0.289

*** N= 4891

Using a similar approach, I also included two measures of respondent's partner SES (capturing just education and occupation, since household wealth was already in the model). Table 5.1 indicates that 16 percent of women had partners with no formal education, 23 percent had partners with primary education, and 33 percent had partners who had achieved secondary or higher education. Similarly, 33 percent of women had partners engaged in agriculture, 21 percent had partners who were manual workers, 21 percent had partners with white collar or professional jobs, and 2 percent had partners who were unemployed. The remaining 22 percent did not have partners.

I used three variables to capture a woman's access to health care. Descriptive statistics suggest that only about 3 percent of women in this sample had visited a voluntary counseling and testing center (CPDV), while 52 percent had access to a health facility in the last twelve months. On the other hand about 48 percent of the women in this sample reported facing at least one barrier (transportation, distance and knowledge of where to go). Index scales were used to measure respondent's knowledge of HIV and HIV prevention methods and two scales to reflect the power of women within their relationships.¹ Women averaged about 7 on the scale of 15 for the knowledge scale, while the average was 2 out of 5 for the domestic decision making scale, and 1.5 out of 5 on the measure of attitudes toward wife beating.

Sexual behavior was measured via multiple indicators for protective and risky sexual behavior. Two variables measuring behavior considered protective included

¹ One measure of relationship power – women's views about conditions under which a woman could refuse sex – had significant missing data problems and is not used in the multivariate analyses. See Chapter 3 for detailed description on the construction of knowledge and relationship power scales.

whether condoms were used at last sexual intercourse and a dummy for celibacy (lack of reported sexual intercourse over the last 12 months). Roughly 24 percent of women indicated using a condom at their last sexual intercourse, while 11 percent reported not having had any sexual intercourse in the last 12 months. Risky sexual behavior was measured using two categorical variables and one continuous variable. These included dummy variables for infidelity (reporting sex with a person other than their partner in last 12 months) and for having multiple partners in the last 12 months. A continuous variable captured the total years of premarital sexual activity. On average women in the CDHS had roughly 2 years of premarital sexual activity, about 9 percent reported being unfaithful to their partners, while 6 percent indicated having more than one partner in the last 12 months.

A woman's marital status was captured via six different variables. These included binary dummy variables for four types of marital status. Roughly 23 percent of women in the CDHS were never married, 52 percent were currently married, 16% were in cohabiting unions, and 8 percent were formerly married (divorced, widowed, or separated). In the models reported below, the currently married group of women was identified as the reference category against which coefficients for the other marital status variables are compared. Additional binary dummy variables reflected whether the respondent had been married at age 16 or earlier, and whether they were in a polygamous marriage. The multivariate analysis sample included 4 percent who had their first marriage before age 16 and 21 percent who were in polygamous unions.

Control variables for religion, place of residence, regional HIV and region of residence were also used in this analysis. A dummy variable for people in rural areas was

used as an indicator for place of residence with 52 percent of the population living in rural areas. A categorical variable was used to measure region of residence. A series of binary (0, 1) dummy variables was created to capture all ten categories and two big cities within this variable. In this multivariate section the collapsed version of region of residence and two major cities (Yaoundé and Douala) is used. One common factor for regions except for Nord, Adamaoua and Extreme Nord is the predominance of Christianity while the regions of Nord, Adamaoua and Extreme Nord, are mostly traditional and Muslim. To avoid saturating the model, the Centre/Sud/Est region was used as the reference category is not included in the estimated models below. Regional HIV rate is included as a continuous variable consisting of estimated regional HIV prevalence. Values range from 1.1 to 11.5 percent, and the average rate was about 6.8 percent.

Religion was used as a measure capturing cultural attitudes and was separated into dummy binary indicator variables for Catholic, Protestant, Muslim, and other. About 38 percent of women in the DHS sample reported being Catholic, 35 percent Protestant, 17 percent Muslim, while about 10 percent reported other faith including no religious faith.

Model Building

In this chapter, the series of logistic regression models predicting the probability that a woman will test positive for HIV was estimated using the bivariate logistic procedure in IBM SPSS 19. Logistic regression is preferable because the dependent variable (HIV status) is a binary variable. Moreover, most of the explanatory variables in this study are a mixture of categorical and continuous measures, making logistic

regression the best analytical tool on predicting HIV risk (Field, 2005). Logistic regression models may be expressed formally as:

$$\text{logit} \left[P \left(Y = \frac{1}{1+Y} \right) \right] = \beta_0 \sum_{j=1}^k \beta_j X_j,$$

where $\text{logit} \left[P \left(Y = \frac{1}{1+Y} \right) \right]$ indicates the natural logarithm that a respondent in this data will test positive for HIV, divided by the probability that the respondent will test negative for HIV, β_0 refers to the intercept of the regression model, and $\beta_j X_j$ refers to regression estimates for the set of predictor variables (1 through k) included in each of this models.

The estimation of models in this study was done in three steps: estimation of component models, nested models and then a series of stratified models. A component model or separate model was estimated for each cluster of variables to see how they behave when used in combination to predict a woman's HIV status. There were total of nine different logistic regression models run for the component models.

The second step involved the estimation of nested models to look at the additive effect of adding successive clusters of variables to a base SES model. SES is the basic model because it is the main focus of this study and understanding the relationship between SES and odds of HIV is necessary first and foremost, with additional variables then added to investigate whether predictions can be improved by measuring non-SES factors. In this study, the initial model investigates the relationship between SES and HIV and then subsequent models add indicators for partner SES (model 2), access to health care, knowledge scale and index scale for domestic decision making within relationships (model 3), indicators for respondent's sexual behavior (protective and risky; model 4), indicators for Marital status (model 5), and finally control variables for religion, region

and place of residence for the final full model (model 6). This final full model includes all theoretically important variables.

Worthy of note is the fact that certain variables were explored but dropped for various reasons. One of the variables dropped as an explanatory variable was age and the quadratic form of age, for lack of significance and problems with collinearity. Variables such as heard of CPDV but not been and early sexual exposure were also dropped from the model because they were insignificant and theoretically less significant but redundant with other measures which became problematic in terms of collinearity.

The third and final step was the estimation of separate models for subsets of women stratified by SES. The main idea with the estimation of these models was to see if the predictive significance (and direction) for key variables differs across women in different SES classes. Since the full model includes all theoretically relevant indicators, it is used for the stratified models, with the result compared the patterns from a full unstratified model.

Assessing Model Fit and Predictive Adequacy

Commonly after the estimation of coefficients for models, it is required to assess how appropriate, adequate and useful the estimated models are. Assessing the goodness of fit therefore means looking at how close values predicted by the various estimated models are to the observed values (Bewick, Cheek, and Ball, 2005). The overall fit of my models was assessed using two different types of tests: the negative log-likelihood (-2LL) and the Homer and Lemeshow statistic (H&L). The predictive adequacy of my models will be assessed using two tests: Cox & Snell and Nagelkerke R-Squares.

Model Fit

The -2LL is a test that examines how much unexplained information there is after the model has been fitted. A likelihood ratio test is used to compare the fit of two models, one of which is the null hypothesis (Tabachnick and Fidell, 2001). We generally expect to see changes in log-likelihood when predictors are added or deleted from models. In the case of my nested models, changes in log-likelihood can be used to test the significance of whether model fit is significantly improved with the addition of other variables. This makes the -2LL a good comparative fit index especially with nested models, as we can test the significance of the difference in the -2LL between two models. -2LL have distributions similar to that of a chi-square distribution with the difference in degrees of freedom. The logic for log-likelihood when only the constant is included is calculated by summing the probabilities associated with the predicted and actual outcomes for each case (Tabachnick and Fidell, 2001). This can be expressed formally as:

$$\sum_{i=1}^N [Y_i \ln(\hat{Y}_i) + (1 - Y_i) \ln(1 - \hat{Y}_i)]$$

To compare two models, you subtract the values of the log likelihood of the bigger model from the smaller model, and then use a test statistic with a chi-squared distribution to evaluate the significance of the change. The bigger model is the model to which predictors have been added. Tabachnick and Fidell (2001), note that models have to be nested in order to be compared, with all the components of the smaller model present in the bigger model. This can be formally expressed as:

$$\chi^2 = 2[LL(bigger\ model) - LL(smaller\ model)]$$

With degrees of freedom equal to:

$$df = k_{bigger} - k_{smaller}$$

As with any chi-square test, statistical significance is determined by the degree of freedom, which is equal to the number of parameters in the new model minus the number of parameters in the old model. In the models presented below, I use conventional thresholds for evaluating significance (a criterion of $\alpha=.05$). The logistic regression procedure in SPSS can produce output including an omnibus test of model coefficients using these significance tests for the change in -2LL.

The Homer and Lemeshow (H&L) statistic and its significance value provide an alternative method to evaluate the overall fit of the model to the observed patterns. The importance of this test is that it tests the hypothesis that “the observed data are significantly different from the predicted values from the model” (Field, 2005:254). A non-significant value is therefore desired because it confirms that the model estimated is not significantly different from the observed data. According to Bewick et al. (2005) this test is similar to a chi-square goodness of fit test, which divides all observations into groups of approximately equal sizes. Dividing all observations into equal sizes gives the H&L statistic an added advantage, as the probabilities of having groups with low observed and expected frequencies is very low. The H&L statistic is obtained by calculating the Pearson chi-square statistic from the 2xg table of observed and expected frequencies, where g is the number of groups. The H&L statistic can be formally expressed as:

$$\chi^2_{HL} = \sum_{i=1}^g \frac{(O_i - N_i \bar{\pi}_i)^2}{N_i \bar{\pi}_i (1 - \bar{\pi}_i)}$$

Where N_i is the total frequency of subjects in the i th group, O_i is the total frequency of event outcomes in the i th group, and $\bar{\pi}_i$ is the average estimated predicted probability of an event outcome (Babubhai and Barnwell, 2003). The H&L statistic is compared to a chi-square distribution with $(g - n)$ degrees of freedom. Large values for H&L statistic with associated small p -values indicate a lack of fit of the model. In this study therefore, a small value for H&L statistic with a non-significant p -value will indicate that the number of HIV cases are not significantly different from those predicted by the model and therefore the overall fit of the model is good. SPSS can generate estimates of the H&L statistic based on allocating observations into equal sized groups (ranked in this case by predicted HIV status). The statistic is then generated based on a table that cross-tabulates the observed incidence of HIV in each ranked group with the predicted frequencies.

Predictive Adequacy

With traditional ordinary least-squares linear regression models, multiple correlations and their coefficient of determination R-squared (R^2) provide a direct measure of how well the model fits the data. Since logistic regression uses an iterative process based on maximum likelihood estimates, an equivalent R^2 does not exist (Field, 2005; Bewick et al., 2005). However, similar approximate measures that assess predictive adequacy have been developed to be used with logistic regression models. The Cox & Snell and Nagelkerke R-Squares are two such measures. These two statistics are pseudo R-squares because they look like R^2 in that they have scales ranging from 0 to 1 (similar to R^2 in OLS), with higher values indicating better model fit. However, they do not have

a simple interpretation (e.g., they are not direct measures of the proportionate reduction of error provided by OLS-based R^2 statistics).

The Cox-Snell R-square (R_{CS}^2) is based on the log-likelihood of the model ($LL(New)$) as compared to the log-likelihood of the original null model ($LL(Baseline)$), with adjustments for the sample size, n (Field, 2005). It can be expressed formally as:

$$R_{CS}^2 = 1 - e \left[-\frac{2}{n} (LL(new) - LL(Baseline)) \right]$$

The major disadvantage with R_{CS}^2 is fact that the theoretical maximum value of 1 is rarely attained. To this effect the Nagelkerke R-Square (R_N^2) was suggested as an amendment, and covers the full range from 0 to 1. To achieve this, the R_{CS}^2 is divided by its maximum possible value:

$$R_N^2 = \frac{R_{CS}^2}{1 - e \left[\frac{2(LL(Baseline))}{n} \right]}$$

If the estimated model perfectly predicts the outcome and has a likelihood of 1, the R_N^2 will then equal 1. The fact that the R_N^2 reaches the theoretical maximum of 1, makes this the preferred of the two pseudo R-squares. It is worth noting that these two pseudo R-squares do not strictly measure the goodness of fit of the model, but rather the usefulness of the explanatory variables in predicting the outcome variable. To this effect they are sometimes referred to as measures of strength of association or measures of effect size (Bewick et al., 2005; Tabachnick and Fidell, 2001). In this analyses therefore the values of R_{CS}^2 and R_N^2 will indicate the usefulness of the model in predicting a woman's HIV status.

Diagnostics Analysis

Since any multivariate regression could have issues with multicollinearity, I examined patterns of correlations and collinearity among the variables used in my models. Unfortunately within SPSS, there is no standard test for assessing collinearity available within the logistic regression procedure. However, as suggested in (Field, 2005), it is possible to utilize the ordinary least-squares linear regression procedure to request standard multicollinearity diagnostics within SPSS. Specifically, patterns of linear covariance among variables in the model can be used to calculate both tolerance and variance inflation factor (VIF) statistics for each variable. Tolerance values less than .1 and VIF values greater than 10 are conventional thresholds for potential concern. Initial collinearity tests indicated that the dummy variable for currently married, as well as the variable for age and the quadratic form, all had VIF values greater than ten and tolerance values of less than 1. Since the currently married variable combined women who were currently in legal unions and women who were cohabitating, two dummy variables were created separating the two categories, which resulted in the VIF tolerance values reaching the desired conventional thresholds. Age and the quadratic form of age were eventually dropped from the analyses because they are not direct predictors of HIV status, and other variables associated with age were already included in the model. A second set of collinearity test were run after age and its quadratic form were dropped and two variables created for currently married and cohabitation. None of the predictor variables in the sample had VIF values greater than 10 or tolerance values less than .1,

indicating that issues of collinearity are no longer a major problem between my predictor variables.

Diagnostic tests were also run for the full model (model 6 in the nested models reported below) to test for the possibility that certain data points were exerting undue influence on the models. To examine undue influence, studentized residuals and Cook's distance were assessed. According to Field (2005), 95 percent of the values for studentized residuals should lie within ± 1.96 and 99 percent of the cases should have values that lie within ± 2.58 . Values above ± 3 are cause for concern. It is however, recommended to look at cases with studentized residuals above ± 2.5 . Cook's distance is a measure of the overall influence of a case on the model. It therefore assesses the effect of a single case on the whole model. It is interpreted as a measure of the change in the regression coefficients if the case is deleted from the model (Field, 2005). Conventionally, Cook's distance values greater than 1 indicate possible influential cases. For this model no value for Cook's distance was greater than 1, though 197 cases had studentized residuals that were greater than ± 2.5 , with only 1 case with a studentized residual greater than ± 3 .

To fully assess what was going on with these 197 outliers, their leverage or hat values were also assessed. Leverage values "gauges the influence of the observed value of the outcome variable over the predicted values" (Field, 2005:165). The average leverage value is defined as $(k + 1)/n$ in which k is the number of predictors in the sample and n is the number of cases being used for the analysis. A case is said to exert undue influence over the model if its values are two or three times the value you would expect for your average leverage values. For this model the average leverage value was

.008 ($38 + 1/4891 = .008$). For the 197 cases with studentized residuals that were above ± 2 , only twenty cases had leverage values that were two times (.016) or three times (.024) the average. Further analysis on these twenty cases showed that potentially what could be driving these data points to be outliers was perhaps the fact that these individuals were all HIV positive but their characteristics seem to be predicting their HIV probability as being low. Most of them were in the high wealth index, had a secondary or higher education and were married to partners with a secondary or higher education. A Logistic regression model was estimated excluding all 197 cases with studentized residuals above ± 2 , and another one run excluding the one case with studentized residuals above ± 3 (table not shown). The coefficients estimated indicated that excluding the cases was not necessary, as the estimates were substantially different from the original full model and did not improve the model in anyway. In all, it is recommended that even if we have leverage values that are little high, but all the statistics such as the Cook's distance and DfBeta (standardized version of Cook's statistic) are fine, there is probably no cause for concern, and therefore no theoretical justification in dropping or deleting the cases (Field, 2005).

Results

Component Models

As discussed above, I first estimated separate models for each cluster of variables that represented theoretically distinct drivers of HIV risk. The resulting component models show the statistical relationship between each variable in the cluster and the

probability that a woman will be HIV positive in this sample. Table 5.2 below shows the results of the different logistic regression models.

Model 1 examines the combined impact of three measures for respondent SES. The results indicate that increased education and wealth are still positively associated with HIV status, though the role of a women's occupation was non-significant once a respondent's education and wealth were accounted for. Specifically, the odds of testing positive for HIV was 1.6 times higher among women with primary education, and 1.7 times higher among women with secondary or more education than among women with no formal education. Compared to women in low wealth households, women in medium and high wealth households were more likely to be HIV positive (OR = 1.86 and 1.93 respectively). A test of model 1 against a constant only model was statistically reliable, with the change in the amount of information explained by adding SES to the model significant ($p > .001$). Therefore using respondents SES significantly improves my ability to predict a woman's HIV status. Moreover, as seen on table 5.3, 93.4 percent of the cases were correctly classified using the various indicators of SES as predictors. The H&L test (2.88) and its significance value (.942) indicate that this model is not only a good fit but also the HIV cases predicted do not significantly differ from those observed in this sample, and therefore a fair representation of the real world. Unfortunately the amount of variance explained by this model is quite low, with just 3 percent ($R^2_N = .03$) of variance explained by the model.

Model 2 explores the distinct influence of a woman's partner's SES characteristics on her chances of testing positive for HIV infection. The results suggest that women whose partners had secondary or post-secondary education had a 1.5 times

increased in HIV rates compared to women whose partners had no formal education and those with no partners. Even controlling for the impact of partners' education level, women whose partners were engaged in professional/white collar or manual/domestic occupations still had more than double the risk of being HIV positive

Model 3 uses three different variables to capture the impact of a woman's access to health care and her probability of testing positive for HIV. Generally speaking, the results confirmed the surprising bivariate analysis findings that greater access to health care was positively associated with HIV status. Women who had visited a voluntary counseling and testing center (CPDV) were 1.9 times more likely to test positive than women who had never been to a CPDV. Women who had visited a health facility in the previous twelve months were 1.5 times more likely to test positive for HIV than women who had not visited a health facility. More surprising is the fact that women reporting any barriers to accessing medical help (such as availability of transport, knowing where to go, or distance to the nearest health facility) had significantly *lower* odds of testing positive for HIV. In fact their chance of testing positive for HIV were 34 percent lower (OR = .66) than for women who did not report facing any barriers to accessing health care.

Model 4 examines the impact of a women's knowledge of HIV and HIV prevention methods on HIV status. Results indicate that women who tested higher on the HIV knowledge scale had surprisingly *higher* odds of testing positive. In other words, each 1 point increase in the HIV knowledge scale was associated with an 11 percent *increase* in HIV risk. Model 5 evaluates the impact of two indicators of a woman's power within her household and relationships. The results suggest that women with greater domestic decision-making authority within their household have a greater chance of

being HIV positive, where each 1 point increase in score on the decision making power scale was associated with a 33 percent increase in the risk of HIV infection. The coefficient for a second scale variable (which captures attitudes toward wife beating) was not statistically significant.

Model 6 and 7 measure the impact of both protective and risky sexual behaviors on the odds of a woman being HIV positive. Overall, the results were as expected in which protective sexual behaviors appear to reduce a woman's risk of HIV, while risky sexual behaviors are associated with increased risk of contracting HIV. Specifically, women who have not had sexual intercourse in the last 12 months were 33 percent (OR = .67) less likely to test positive for HIV. Interestingly, the use of condoms was not at all related to HIV risk (both using the variable for condom use at last sexual intercourse, but also when we used other versions of the condom use variables). In terms of risky behaviors, each additional year of premarital sexual experience increased a woman's chances of being HIV positive by 10 percent, while women who were unfaithful to their partners had 1.5 times higher odds of being HIV positive. However, the dummy variable for women who had multiple partners during the previous years was not significant.

Model 8 examined the impact of several indicators for a woman's marital status on her odds of being HIV positive. Overall, women who had never been married had lower HIV rates, though early marriage seems to provide some protection, while being in a polygamous union was not significantly associated with HIV risk. Specifically, women who were never married were 39 percent less likely to test positive for HIV than women who were currently married. The greatest increases in HIV were associated with women who were divorced or widowed and women who were currently cohabitating who were

over 4.3 and 2.5 times more likely (respectively) to be HIV positive than women who had currently married. On the hand, women whose first marriage occurred under the age of 16 were 33 percent less likely to test positive for HIV (net of the effects of their current marital status).

The final component model (model 9) examines the influence of religion, region HIV, place and region of residence on HIV. There was no significant relationship between religious affiliation and a woman's HIV status. Place of residence showed a significant association with HIV status as women in rural areas compared to their urban areas counterparts were 34 percent less likely to test positive for HIV. Region HIV indicated that each one percent increase in the regional HIV rates created a 21 percent *higher* odds of testing positive for HIV. This suggests that context is an important variable capturing some residual unmeasured characteristics that place of residence and religion are not capturing. Only the Nord/Adamaoua/Extreme Nord region showed a significant association with female HIV. Results indicate that women in this region were 12 percent less likely to test positive for HIV compared to their counterparts in the Centre/Sud/Est region. Concerning the two major cities women in Yaoundé were 24 percent less likely to be test positive for HIV, while women in Douala were just 7 percent less likely to test positive for HIV compared to women in the Centre/Sud/Est region.

Table 5.2 also shows fit statistics for all nine models; with the overall fit for each of the nine component models being good. All nine models had an omnibus coefficient test that was significant ($p < .001$), suggesting that predictors used in each model significantly improved my ability to predict a woman's HIV status. All models except for

model 7 (risky behavior) had low H&L values with nonsignificant values ($p < .05$),

indicating that the HIV cases predicted by the respective are predicting the real world

Table 5.2: Effects of Respondent Characteristics on the Odds of Testing Positive for HIV among Women in Cameroon

	Basic SES	Partner's SES	Access	Knowledge	Power	Protective Behavior	Risky Behavior	Marital Status	Controls
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
<i>Odds-Ratios (exp B)</i>									
Respondent Socioeconomic Status									
<u>Respondent's Education</u>									
No formal education (reference)									
Primary Education	1.600 **								
Secondary Education or Higher	1.697 **								
<u>Respondent's Occupation</u>									
Agriculture (reference)									
Unemployed	0.730								
Manual or Domestic	1.287								
Professional/White Collar	0.780								
<u>Respondent's Wealth Category</u>									
Low (reference)									
Medium	1.859 ***								
High	1.934 ***								
Partner's Characteristics									
<u>Partner's Education</u>									
No formal Education (reference)									
Primary Education		1.315							
Secondary education or Higher		1.471 *							
<u>Partner's Occupation</u>									
Agriculture (reference)									
Unemployed		0.799							
Professional/White Collar		2.400 ***							
Manual or Domestic		2.331 ***							
Access to Health Care									
Visited a Voluntary Counseling & testing Center			1.868 *						
Visited a Health Facility in the Last 12 Months			1.510 ***						
Barriers to Medical Help			0.662 ***						
Knowledge of HIV Prevention Method									
Index Scale of Positive Indicators of HIV				1.107 ***					
Power in Relationships									
Index Scale for Domestic Decision					1.329 ***				
Index Scale Reflecting Attitudes Toward Wife Beating					0.954				

[illegible]

fairly well. In addition, each model correctly classified 93.4 percent of the cases using their respective predictors. Unfortunately the variance accounted for by most of the models was small. Model 8 (marital status) had the highest explained variance of all the models $R_N^2 = .07$ (7%), while model 6 (protective behavior) had the lowest explained variance $R_N^2 = .004$ (.4%).

Nested Models

The next sets of results explore how the relationship between SES and HIV changes with the progressive addition of the other sets of predictors. With nested regression models, a baseline model is specified and then clusters of other predictors are successively added to the model. All sequential models retain predictors from the previous model which allows me to compare whether any of the added variables significantly add to the prediction of a woman's HIV status beyond that afforded by the initial model.

In this study, since SES is the main focus, the initial model (model) examines the impact of respondent's SES (education, wealth and occupation) and her HIV status. Model 1 is identical to the first component model reported on Table 5.2 above. Subsequent models introduce sets of variables that theoretically influence a woman's risk of HIV. Specifically, Model 2 examines the association between respondent SES and HIV while also controlling for partner's SES. In subsequent models, I progressively add indicators for: access to health care, knowledge of HIV, and power within relationships (model 3), protective and risky sexual behaviors (model 4), marital status (model 5) and variables for religion, place of residence, region HIV and region of residence (model 6).

Differences between the models are assessed using the various fit statistics for overall fit of model and predictive adequacy are also examined to determine the impact and significance of adding other factors to the model in explaining patterns of HIV status (Table 5.3).

In Model 1, I examine a simple basic model with just three measures of respondents SES as predictors as indicated in the results of the component model above, HIV was generally positively related to a woman's SES, though occupation was not significantly associated with HIV status after accounting for education and wealth. Overall the model was a good fit for the data, though the amount of variance explained was quite low.

In model 2, I add partners SES to the basic SES model. Overall model fit as seen in change in -2LL was good: the effect of adding partner's SES to model 2 significantly reduces the -2LL from 2328 to 2278, which tells me that including partners SES significantly improves my ability to predict whether a woman will be HIV positive or not. The classification table indicates that this model also correctly classifies 93.4 percent of cases, same as model 1. Similarly, the H&L test (15.24) and its significance value (.06) which is non-significant, indicates that the HIV cases predicted by this model are not significantly different from the real world. This model sees an improvement in the amount of variance explained ($R_N^2=.06$) though it is still quite small. Interestingly, adding partner's SES to model 2 attenuates the relationship between a woman's SES and HIV. Specifically, the coefficient for women with a primary education becomes non-significant, while the impact of secondary or higher education for women is much reduced (suggesting that some of the impact of higher education on female HIV risk is a

reflection of partner education and occupation). We also see a weakened association between wealth and HIV, though women in medium and high wealth households were still 1.6 and 1.5 times more likely, respectively, than women in the low wealth groups to test positive for HIV. The relationship between a woman's occupation and HIV status remains non-significant. The direct impact of partner's SES in Model 2 suggests that partner's occupation is more important than their educational level. Women with partners in professional or white collar and manual or domestic jobs were over two times more likely than women with partners in the agricultural sector to test positive for HIV. Coefficients for variables measuring women's partner's education failed to reach the criterion for significance.

Model 3 examines the additional explanatory power achieved when accounting for a woman's access to health care, knowledge of HIV and power within their relationships. Overall, the addition of these variables significantly improves the model fit, as measured by change in -2LL. Further, we see a tremendous reduction in the values for H&L test (5.900) and its significance value (.658) indicating that the set of predictors in this model reliably distinguish between HIV positive and HIV negative women. The model does provide an additional increase in the amount of variance explained ($R^2_N=.08$) though it is still relatively small.

The coefficients for the new variables suggest that women who report more barriers to accessing medical help had 23 percent lower odds of contracting HIV. After accounting for other variables in the model, visits to health clinics and greater knowledge of HIV prevention techniques do not appear systematically related to the odds of testing positive for HIV. Meanwhile, measures of a woman's power in her relationships

produced significant coefficients, though their substantive meanings appear somewhat contradictory. On the one hand, women who report greater domestic decision making authority within their households had higher HIV rates; a one point increase on the domestic decision making scale increased the risk of HIV for women by 19 percent. On the other hand, women who had less tolerant views of wife beating had a reduced HIV risk; a one point decrease on the scale reflecting attitudes toward wife beating reduced the risk of testing positive for HIV by 9 percent.

The new variables in Model 3 attenuate somewhat the SES-HIV relationship observed in earlier models, suggesting that some of the SES-HIV link was related to differential access, knowledge or power across the SES groups. Specifically, significant differences were no longer detected between any of the educational categories and HIV status. The coefficient for the high wealth dummy variable also drops below the threshold for statistical significance, though the value still suggests higher odds for women in this group. Though weakened, women in medium wealth households remain significantly more likely to test positive for HIV than women who were in the low wealth category. Interestingly, after accounting for access, knowledge, and power, the coefficient for professional/white collar profession reaches statistical significance (although the magnitude and direction of the coefficient is similar to previous and later models) Specifically, the results in this model indicate that women in professional or white collar profession had a 50 percent lower odds of testing positive for HIV ($OR = .50$), compared to women in the agricultural sector. Partner's occupation remained significant as women with partners in professional/white collar professions and manual or domestic professions were almost twice as likely to test positive for HIV.

Model 4 adds information about respondent's protective and risky sexual behaviors. The addition of these variables reduced the -2LL from 2234 to 2197 (a reduction of 37 from model 3), and was significant ($p < .001$), indicating a significant improvement in my ability to predict a woman's HIV with the inclusion of variables for sexual behavior. This model correctly classifies 93.4 percent of my cases, with a notable slight increase in the amount of variance explained (10% or $R_N^2 = .098$). The H&L test (8.013) and its significance value (.432) indicate that this model is not only a good fit but also the HIV cases predicted do not significantly differ from those observed in this sample, and therefore a fair representation of the real world.

Surprisingly, indicators for protective behaviors – condom use and chastity – did not significantly contribute to explaining patterns of HIV status. However, measures of risky behavior generally behaved as expected. Higher numbers of years of premarital sexual exposure were significantly and positively associated with a woman's HIV status. Specifically, each additional year of premarital sexual activity increased a woman's risk of testing positive for HIV by about 9 percent. Other indicators for risky sexual behavior such as being unfaithful to a partner or having multiple partners in the previous 12 months produced nonsignificant coefficients, though still suggesting that this group of women were at higher risk of testing positive for HIV.

To my surprise, the addition of these behavioral variables failed to substantially change the observed relationships between a woman's SES, partners SES, and HIV. Model 4 results suggest that women in professional/white collar jobs still have lower odds of testing positive for HIV compared to women in the agricultural sector. Women in the medium wealth index were 1.41 times more likely to test positive for HIV

compared to women in low index wealth category. Addition of sexual behavior to model did increase the strength of the association between partners' occupation and a woman's HIV status.

Model 5 shows the impact of adding several new indicators that capture information about a woman's marital status. The addition of marital status to model significantly improves my ability to predict a woman's HIV status. The addition of these indicators reduced the -2LL from 2197 to 2134 (a reduction of 63 from model 4), and was highly significant ($p < .001$). This expanded model provides an increase in the amount of variance explained (13% or $R_N^2 = .130$). We see a reduction in the values for H&L test (6.420) and its significance value (.791), indicating that the set of predictors in this model reliably distinguish between HIV positive and HIV negative women.

Despite these gains, the only marital status variable that reaches statistical significance is the indicator for women who were formerly married (cohabitating, divorced or separated). Relative to currently married women, women who were separated, widowed or divorced were over 3 times more likely to test positive for HIV. Indicators for other marital status produced coefficients that are consistent with bivariate patterns, but were not statistically significant.

By accounting for the current marital status of respondents, the observed association between a woman's SES and her HIV status becomes even more attenuated, with coefficients for every indicator except women in professional or white collar jobs becoming nonsignificant. Specifically, net of the effects of the other variables in the model, women in professional/white collar were less than half as likely as women in the agricultural sector to test positive for HIV. Partner's occupation remained significantly

associated with a woman's HIV status, though the magnitude of the impact was smaller. Unexpected was the fact that accounting for marital status allowed coefficients for indicators for access to health care to become significant. This suggests that marital status interacts in some way with health care access in shaping the risks of contracting HIV. The model 5 results suggest that the odds of testing positive for HIV were higher among women who had visited a CPDV health facility in the previous 12 months. Meanwhile, the addition of marital status variables did not substantively change the direction or size of relationships between HIV and barriers to health care, decision-making power, and risky sexual behaviors.

In my final model 6, I add variables to control for respondent's religion, region HIV, place residence and region of residence. The overall fit of this model is good and an improvement from the previous one. The amount of unexplained variance as measured by change in the value of -2LL is significant, and the lack of significance in the H&L test suggests that the full model reliably distinguishes between HIV positive and HIV negative women. This model correctly classifies 93.4 percent of the cases, with an explained variance of 17 percent ($R_N^2=.168$).

Indicators for religion and place of residence failed to reach statistical significance though substantial significant differences were detected between a region and one big city. Residents of Nord/Adamaoua/Extreme Nord were 1.5 times more likely than the residents of the Centre/Sud/Est to test positive for HIV. Statistical significance was not detected between the other regions. Of the two big cities, only Yaoundé reached the criterion for statistical significance as its residents were 17 percent less likely than the residents of the Centre/Sud/Est to test positive for HIV. Significant coefficient for region

HIV indicated that a one percent increase in regional HIV increased the risk HIV by 22 percent, again indicating that regional HIV is a significant component in explaining risk of female HIV risk. The fact that regional HIV was still significant (net the effects of other factors, including religion and place of residence) indicates that it captures some unmeasured residual effect.

Controlling for religion, place and region of residence improved the fit of the model without changing the direction of the relationship between women in professional or white collar professions and HIV status. Model 6 also shows that relative to currently married women, women who cohabit were 2.6 times more likely to test positive for HIV, while formerly married women were 4.2 times at risk of HIV.

Table 5.3: Cumulative Effects of SES and Other Respondent Characteristics on the Odds of Testing Positive for HIV among Women in Cameroon.

	Basic SES	Partner's SES	Access/Knowledge/Power	Sexual behavior	Marital Status	Controls
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<i>Odds-Ratios (exp B)</i>						
Respondent Socioeconomic Status						
<u>Respondent's Education</u>						
No formal education (reference)						
Primary Education	1.600 *	1.415	1.312	1.151	1.137	1.103
Secondary Education or Higher	1.697 **	1.560 *	1.410	1.185	1.115	1.190
<u>Respondent's Occupation</u>						
Agriculture (reference)						
Unemployed	0.730	0.762	0.965	0.994	0.955	1.022
Manual or Domestic	1.287	1.035	1.036	1.036	1.024	1.127
Professional/White Collar	0.780	0.580	0.495 *	0.457 *	0.464 *	0.502 *
<u>Respondent's Wealth Category</u>						
Low (reference)						
Medium	1.859 ***	1.611 **	1.505 *	1.450 *	1.441 *	1.332
High	1.934 ***	1.547 *	1.361	1.313	1.458 *	1.315
Partner's Characteristics						
<u>Partner's Education</u>						
No formal Education (reference)						
Primary Education		1.210	1.046	1.074	1.025	1.020
Secondary education or Higher		1.236	1.078	1.074	0.897	1.006
<u>Partner's Occupation</u>						
Agriculture (reference)						
Unemployed		0.773	0.763	0.845	0.684	0.716
Professional/White Collar		2.220 ***	1.843 ***	2.006 ***	1.745 **	1.711 **
Manual or Domestic		2.151 ***	1.859 ***	2.022 ***	1.720 **	1.806 **

[illegible]

In summary all models in the nested model have nonsignificant H&L and indicate that each cluster of variables helps improve our ability to predict a woman's HIV status. Model 6 represents the 'full model' which includes all relevant variables and has the best overall fit. As such, I use it as the basis for stratified models described in the next section.

Stratified Models

The third and final step in my multivariate analyses was the estimation of separate models for subsets of women stratified by SES. The main idea with was to see if the predictive significance (and direction) for key variables differs across women in different SES classes. Model 6 from my nested model is used as the basis for the stratified models because it includes all theoretically relevant and/or empirically significant indicators.

Because wealth and education represented the SES variables that were most related to HIV status, I stratified the respondents first by the three household wealth categories, and then by the level of the respondent's formal educational attainment. Table 5.4 presents the odds ratios associated with each key variable for each of the separate SES subgroups. Results for the separate models also are compared to new 'full' models that include all women, and which are identical to the full model reported in Table 5.3 with the exception that it excludes the specific SES variables that had been used to stratify the subgroups.

For women in the low wealth subgroup, most of the coefficients in model 1 failed to reach the criterion for statistical significance. The exceptions were indicators for women whose partners worked in a professional/white collar profession, who faced

barriers to obtaining medical care, and region of residence. Low wealth women whose partners were in manual or domestic professions were over 3 times more likely to test positive for HIV than women whose partners worked in the agricultural sector (net of the impact of other variables in the model). Low wealth women had multiple sexual partners within the last 12 months were also over 3 times more likely to test positive for HIV than low wealth women who reported 1 or no partner. Compared to low wealth women who were currently married, women who were separated, divorced or widowed in the low wealth index, were over 4 times more likely to test positive for HIV. Region HIV was significantly associated with a woman's HIV status. Though we consistently see a significant value for regional HIV across all SES groups, the biggest impact for regional HIV was for women in low wealth and low education women who for every 1 percent increase in regional HIV, saw a 32 percent increased risk of HIV. Relative to women who lived in the Centre/Sud/Est, low wealth women who lived in Nord/Adamaoua/Extreme Nord were over two times more likely to test positive for HIV. Most of the other indicators failed to reach the criterion for statistical significance; some of the coefficients for indicators such as education, partner's occupation and marital status, though insignificant, stay consistent with patterns seen in the full unstratified model.

For the women in the medium wealth group, those with a primary education were almost 3 times more likely to test positive for HIV than women with no formal education. Interestingly, the 'bump' in HIV rates among women with secondary or post-secondary education was not significant among the medium wealth group. As with the low wealth group, there was no statistical significant association between a woman's occupation and

her HIV status. Partner's occupation was associated with a woman's HIV status.

Medium wealth women whose partners had professional/white collar or manual/domestic jobs were roughly twice as likely to have HIV as women whose partners worked in the agricultural sector. Interestingly, for medium wealth women, having visited a health facility in the last 12 months increased their risk of testing positive for HIV by 1.7 times, while facing barriers to accessing health facilities reduces their odds of testing positive for HIV by 44 percent. Among this group, each additional year of premarital sex increased a woman's risk of HIV by about 9 percent. This medium wealth stratified model also showed that cohabitation and being formerly married increased the odds of HIV. Relative to currently married women, women who cohabit (OR = 3.25) or were widowed, divorced or separated (OR = 3.72) were at substantially increased risk of testing positive for HIV. Place of residence failed to achieve any criterion for statistical significance. The only region to reach statistical significance the Nord/Adamaoua/Extreme Nord, with medium wealth women in this region over three times more likely to test positive for HIV, compared to women in the centre/Sud/Est regions. Moreover, the significant coefficient for region HIV indicated that a 1 percent increase in regional HIV increased the odds for women in the medium wealth group by 19 percent. Compared to medium wealth women who indicated catholic religious affiliation, medium wealth women indicating a protestant religious affiliation were 1.9 times more likely to test positive for HIV.

For women in the high wealth group, there was no association between a woman's SES and her HIV status except for women in the professional/white collar profession who appeared to have a 60 percent (OR = .397) decline in the odds of testing

positive for HIV. This model also showed that for women in the high wealth category an additional year of premarital sexual exposure increased their odds of testing positive for HIV by 8 percent. Among high wealth women, both indicators of power in relationships were significant, though the direction of the association was interesting. High wealth women who had more authority over household domestic decisions had an elevated HIV risk, while those who were less tolerant of wife beating had a lower HIV risk as they were 17 percent less likely to test positive for HIV. Two marital status variables increased the risk of HIV for women in the high wealth index category: relative to women who were currently married, those who were cohabiting were 2.9 times more likely and those who were widowed, divorced or separated were 1.5 times more likely to test positive for HIV. None of the place of residence or regional variables or religious affiliation variables achieved the criterion for statistical significance. Region HIV on the other hand was significant and the direction indicated that a 1 percent increase in regional HIV saw a 27 percent increase in the odds of HIV risk for high wealth women.

Taken as a whole, the stratified models did uncover some differences across women of different wealth classes. Low and medium wealth women were more influenced by their partner's occupational characteristics, while high wealth women were more affected by their own occupational type. Medium wealth women were the only ones with significant coefficients for education, and results suggested that the biggest educational 'risk factor' for this group involved moving from no formal education to simple primary school education. The surprising pattern linking increased barriers to health care with reduced risk of HIV appears to be more common among low and medium wealth women, while the increase in observed HIV among women who

frequented health clinics was more strongly an issue among the medium wealth group. Conversely, the only group for which indicators of power in relationships made a difference was among high wealth women. Years of pre-marital sexual exposure and current marital status were important determinants of HIV status among medium and high wealth women, but not among low wealth women. Finally, the significant region HIV coefficients for all wealth groups suggest that 'regional' effect was important across all wealth groups.

Model 4, 5 and 6 present odds ratios for key variables stratified by respondent's level of formal education. Among women who reported no formal education, the respondent's wealth was not associated with HIV. However, surprisingly among women with no formal education, those unemployed were 75 percent ($OR=.246$) less likely to be HIV positive compared to women in agricultural sector with no formal education. There was also evidence that HIV among this group is significantly related to whether women had partners with a secondary or higher education or who worked in manual/domestic jobs and seemed to be an important determinant of HIV risk for women with no formal education. Relative to women whose partners had no formal education, women whose partners had a secondary or higher education were over 8 times more likely to test positive for HIV, while women with partners in manual or domestic were 3.4 times more likely to test positive for HIV. Being tolerant of wife beating also increased risk of HIV for women with no formal education. Results showed that a point decrease in the scale reflecting attitudes toward wife beating reduced the risk of being HIV positive for women with no formal education by 22 percent. There was also evidence that HIV status for women with no formal education was significantly related to whether a woman was

formally married or not. Relative to women who were currently married, women who were divorced, separated or widowed were over 10 times more likely to test positive for HIV. As with the model for low wealth women, the odds of being HIV-positive was also influenced by region HIV, as each 1 percent increase in regional HIV increase the risk of HIV for women with no formal education by 43 percent. Neither religious affiliation, place of residence or region of residence was significantly associated with HIV status for women in this group.

Model 5 present's results for women with intermediate levels of education (completed a primary education). Among this group, women in medium wealth households were more likely to have HIV. Interestingly, this parallels results shown in Model 2 where moderate wealth interacted with moderate education to increase HIV risks. Significant coefficients for partner's occupation also suggested higher HIV risk for women with a primary education when their partners worked in the professional/white collar professions or did manual/domestic work (compared to women whose partners worked in the agricultural sector). Among this group of women, having accessed a health facility in the previous twelve months increased HIV risk. Interestingly, women with a primary education who had more authority making household domestic decision faced an elevated risk of HIV. Similarly each additional year of premarital sexual intercourse increased risk of HIV for this group of women by 8 percent. Model 5 also shows that women who were widowed, divorced or separated were over 4 times more likely to test positive for HIV, while cohabiting women were almost 3 times more likely to test positive than women who were currently married. The Nord/Adamaoua/Extreme Nord was the only region of residence with a significant coefficient as women with primary

education in these regions were 2.5 times more likely to test positive for HIV (compared to the regions of Centre/Sud/Est). The significant coefficient for regional HIV indicated a positive association between regional HIV rates and increased risk for women in this group. There were no significant differences between place of residence, religious affiliation and a woman's HIV status in this group.

Model 6 shows results for women who have completed a secondary or higher education. Among this group of women, there was no significant association between their HIV status and any of the indicators for the respondent's SES, their partner's SES, access to health care, or HIV knowledge. However, one of the risky behavior measures - years of premarital sexual intercourse - was positively associated with testing positive for HIV. Two of the marital status variables were also significant. Relative to currently married women, highly educated women who cohabit were almost 2 times more likely, while women who were widowed, divorced or separated were 3.8 times more likely to test positive for HIV. Having less tolerance for wife beating was associated with less risk for women with higher education: highly educated women who were less tolerant of wife beating had 15 percent *lower* odds of testing positive for HIV. No significant differences were seen between place or region of residence and a highly educated woman's HIV status. However, region HIV, like with all other SES groups was significantly associated with HIV status for women in this group.

Overall, these models stratified by the different education categories uncovered some differences in HIV risk. Women with no formal education and primary education like wealth were influenced by their partner's occupation, while women in the high wealth index were influenced by their own occupation. Relative to women who had

partners working in the agricultural sector, having partners in professional/white collar or manual/domestic significantly increased their risk. Parallel to results seen with medium wealth women, the biggest risk factor for women with primary education was being in the medium wealth category. The interesting relationship between access to health care and HIV was only significant for women with an intermediate education. Accessing a health facility in the last 12 months increased their risk, while facing any barriers to accessing these health facilities reduced their risk. Intolerance of wife beating was significant only for women who completed a secondary or higher education. Years of pre-marital sexual exposure and current marital status were important determinants of risk among women with a primary and secondary or higher education, but not among women with no formal education.

Table 5.4 also shows fit statistics for all six models; with the overall fit for the six models being reasonably good. The -2LL for all models compared to their respective constant-only models was statistically reliable $p > .001$, indicating that the predictors as a set in each of the six models, reliably distinguished between women who were HIV positive and women who were HIV negative. Overall, all six models significantly predicted a woman's HIV status fairly well, with over 90 percent of the cases correctly classified for each model. The H&L test and its significance values for all but one model indicated that the models were predicting HIV cases in a manner that was indistinguishable from the observed patterns in the DHS sample. Interestingly, the estimated explained variance for stratified models was generally higher than for the equivalent unstratified models, though the high wealth and high education groups had R^2 values that were slightly lower than the unstratified benchmark model.

Table 5.4: Effects of Respondent Characteristics on the Odds of Testing Positive for HIV among Women in Cameroon, Stratified by SES

	Model 1 Low Wealth	Model 2 Medium Wealth	Model 3 High Wealth	UN- STRATIFIED BASELINE Model 7a	Model 4 No Education	Model 5 Primary Education	Model 6 Secondary or Higher	UN- STRATIFIED BASELINE Model 7b
<i>Odds-Ratios (exp B)</i>								
Respondent Socioeconomic Status								
<u>Respondent's Education</u>								
No formal education (reference)								
Primary Education	0.588	2.820 *	1.080	1.110				
Secondary Education or Higher	1.343	1.986	1.107	1.223				
<u>Respondent's Occupation</u>								
Agriculture (reference)								
Unemployed	0.618	1.439	0.876	1.088	0.246 *	1.175	1.211	1.029
Manual or Domestic	1.194	1.666	0.849	1.188	0.790	1.278	1.120	1.132
Professional/White Collar	0.000	0.843	0.397 *	0.528	0.000	0.000	0.719	0.512 *
<u>Respondent's Wealth Category</u>								
Low (reference)								
Medium					0.434	1.776 *	1.103	1.340
High					0.550	1.217	1.391	1.338
Partner's Characteristics								
<u>Partner's Education</u>								
No formal Education (reference)								
Primary Education	1.457	0.842	0.870	1.029	0.714	1.065	1.009	1.033
Secondary education or Higher	1.180	0.782	1.108	1.023	8.008 **	0.856	0.969	1.034
<u>Partner's Occupation</u>								
Agriculture (reference)								
Unemployed	1.304	1.324	0.329	0.726	4.236	1.103	0.259	0.724
Professional/White Collar	1.544	2.142 *	1.035	1.770 **	1.928	3.061 ***	0.891	1.727 **
Manual or Domestic	3.634 ***	2.018 *	1.019	1.856 ***	3.410 *	2.326 **	1.152	1.818 **
Access to Health Care								
Visited a Voluntary Counseling & testing Center	1.325	2.395	1.896	1.768 *	0.000	1.846	1.783	1.779 *
Visited a Health Facility in the Last 12 Months	1.340	1.730 *	1.278	1.369 *	1.438	1.903 **	0.944	1.373 *
Faced Any barriers to Accessing Health Facilities	0.635	0.560 *	0.870	0.702 **	0.786	0.674	0.683	0.712 **
Knowledge of HIV Prevention Method								
Index Scale of Positive Indicators of HIV	0.959	0.971	1.016	0.996	0.937	0.950	1.069	0.998
Power in Relationships								
Index Scale for Domestic Decision	1.080	1.172	1.135 *	1.117 *	0.970	1.168 *	1.085	1.113 *
Index scale Reflecting Attitudes Toward wife Beating	0.982	0.932	0.827 **	0.905 *	0.785 *	0.975	0.854 *	0.905 *

Summary

Overall, the relationships between SES and HIV among women in Cameroon appear complex. Some of the model results are logical and expected (such as additional years of premarital sexual activity increasing HIV risk, or partners in professional or white collar professions increasing risk of HIV for women). However, there are several unexpected findings, including the fact that having more access to medical help, facing fewer barriers to accessing health care and even having visited a health facility in the previous twelve months are associated with increases in a woman's risk for HIV, even after controlling for many other factors. Even more unexpected is the fact that women who report having more power within their relationships also have a higher risk of HIV. The next chapter will review the results and discuss the implications for the research literature and possible policy prescriptions.

CHAPTER 6

SUMMARY AND CONCLUSIONS

This dissertation sought to understand the influence of socioeconomic status on the risk of contracting HIV among women in Cameroon. My analysis was designed to specifically answer the following core research questions:

- 1) Why are the benefits of better economic status not impacting the risk of HIV for high SES women?
- 2) Do the mechanisms that put women at increase risk of HIV in Cameroon differ by SES? Specifically, this study look at the following sub questions:
 - a. How does SES affect the ability of women to avoid behaviors that expose them to HIV risk?
 - b. How does SES influence access to knowledge, health care cultural norms, and power within relationships that influence behaviors that increase women's risk of HIV?

The data used for this study was the 2004 Cameroon Demographic and Health surveys (CDHS), conducted by the government of Cameroon and several international agencies. I used bivariate and multivariate statistical analyses to examine the relationship between a woman's SES status and HIV, SES and other determinants of HIV, and to see if these determinants varied by a woman's SES.

Hypotheses and Results

Evidence for Positive SES-HIV Relationship?

I expect high SES women to report increased benefits from having access to resources which should reduce their risk to HIV infection. Specifically;

H1a. Among high SES women, I expect their greater access to resources to increase their access to health care, increase their awareness of HIV and HIV prevention methods, and reduce risky sexual behaviors, which should in turn reduce their risk of HIV.

H1b. Among low SES women, I expect their economic vulnerability to reduce their access to health care facilities, limit their knowledge of HIV and HIV prevention methods, limit the amount of power they wield within a relationship, and to initiate sexual activity early, should increase their risk of HIV.

What my results show is that Cameroonian women in the higher SES groups have higher rates of HIV and that factors that traditional epidemiology theorized will reduce risk failed to perform as expected. Each SES indicator showed that women in the higher SES indicator were at increased risk. My results show that high SES women do in fact have greater access to medical help, command greater knowledge of HIV prevention methods, as well as greater decision making authority within their relationships, but these links fail to protect them from having high HIV rates. As expected, low SES women command little knowledge of HIV prevention methods, reported less decision making within their relationships, had limited access to health care, but still experienced lower rates of HIV.

In fact, a number of bivariate patterns defy conventional expectations. For example, women who had accessed a CPDV or a health facility in the previous 12 months had higher rates of HIV infection, and women who reported facing any barriers to accessing health care had the lowest rates of HIV compared to women who had no

difficulties accessing health care. Similarly, women who commanded more domestic decision making power within their respective households had higher HIV rates. In the same light, women who had ever used a condom also had significantly higher HIV rates.

Contrary to major theoretical expectations about infectious disease including HIV, women in the higher wealth households had disproportionately higher rates of HIV infection in Cameroon. Multivariate analyses indicate that these results may be a function of other mediating proximate factors such as sexual behavior, marital status and place of residence, and in certain cases we saw attenuation in the SES-HIV link once these factors were accounted for. However, these results generally indicate that high wealth women in Cameroon remain at least as likely as poorer women to be HIV infected, if not more.

Taken as a whole, it appears that SES does create the socioeconomic and cultural advantages that produce greater knowledge, access to health care, and power within relationships that should convey protection from HIV infection. However, the increased levels of these intermediate factors were not systematically related to changes in behavior that might reduce HIV risk, and were inversely related to HIV rates among women in the CDHS sample. As a result, I would say that both hypotheses are partially supported (except for their ultimate expected relationships to HIV risk).

Evidence for Negative SES-HIV Relationship?

As discussed in Chapter 2, the positive relationship between SES and HIV in Cameroon does reinforce some emerging findings in the literature about HIV in Sub-Saharan Africa. In the design of my research, Specifically, I predicted that:

H2a. Among high SES women I expect that their later age at first marriage

(which increases the number of years they are involved in pre-marital sexual behavior) will directly increase their risk of HIV.

In the case of Cameroon, the age at which a woman had her first marriage was significantly associated with both her SES and HIV status. In fact there appears to be a stepwise increase in HIV rates as a woman's age at first marriage increased, with women who married at age twenty and over having the highest rates. This result confirms what I was expecting, especially as we consistently observed that the longer the years a woman had between her first sexual intercourse and her first marriage, the higher the probability that she was going to test positive for HIV. Additionally, while currently married women have relatively low HIV rates (suggesting a protective effect of marriage), Cameroonian women who were formerly married (e.g., currently separated, divorced or widowed) have the highest rates of HIV in the sample. It would appear that loss of husband (or change in marital status) due to past HIV infections of married women and/or their partners' is a major driver of current patterns of female HIV status. Taken as a whole, hypothesis H2a was confirmed.

H2b. Among low SES woman I expect there to be lower rates reported

polygamous marriages which should reduce their risk of HIV.

The literature contended that low SES women were less likely to be in polygamous unions because polygamy was supposedly more common among high SES men who are able to afford multiple women. Moreover, studies found that women in multiple unions had higher rates of HIV compared to women who were in monogamous relationships. To this effect I had expected that among women in my Cameroonian

sample, being in a polygamous union will not only be more prevalent among women in higher SES households but also would be a risk factor for them as well. Surprisingly, my results indicate that women in low wealth household were more likely to be in polygamous unions. Moreover, there was no significant association between polygamy and a woman's HIV status. Taken as a whole, H2b can be rejected.

***H2c.** Among high SES women I expect there to be higher rates of infidelity and an increased incidence of multiple sexual partners, which should increase the risk of HIV.*

Among my sample of Cameroonian women in the high SES category, I had expected them to report higher rates of infidelity, by virtue of the fact that not only were they to more likely have multiple partners, but because of their increased access to resources and travel, more likely to practice riskier sexual behaviors such as this. My results do in fact confirm this expectation as women in medium and high wealth households and those with more education were not only more likely to report multiple partners, but were also more likely to have had sexual relations over the previous year with individuals other than their current partners. As expected there was a positive relationship between infidelity and HIV infection as women who reported this behavior had higher rates of HIV infection. Overall, there is strong support for hypothesis H2c.

***H2d.** I expect partner's SES in Cameroon to play an important (indirect) role in female risk of HIV. Specifically, I expect women in the high SES group to also report partners in similar or higher SES group which should in turn increase their risk of HIV, because their partners were more likely to practice riskier sexual behaviors.*

Women in the Cameroon CDHS predominantly married partners of the same socioeconomic circumstances, as was expected. In addition, there was a positive relationship between her partner's SES and rates of HIV. With every increase in partner's education, a woman's risk of HIV increased tremendously. Similarly, women with partners in occupations such as manual domestic and professional/white collar had higher rates of HIV compared to women who reported a partner working in the agricultural sector. The results support hypothesis H2d and partner's SES appears to play a role in shaping the risk of HIV for women in Cameroon. It is worth noting that DHS data used in this study limits my ability to directly link female HIV risk with her partner's sexual behavior, and the apparent role of partner's SES is based on other previously published research.

Do the Determinants of Female HIV Vary by SES in Cameroon?

A central question in this dissertation was to explore how the determinants of HIV risk will be different for women in different SES classes. I expected therefore that as I controlled for SES, the traditional models as enumerated by most epidemiologic studies would apply more to low SES women. In contrast, for high SES women I expected norms and behaviors related to dating, marriage, and norms of sexual behavior to be more significant in predicting HIV risk. Specifically, I generated two specific hypotheses:

H3a. *For Low SES women, I expect that traditional determinants such as limited access to health facilities, lower knowledge of HIV and HIV prevention methods, limited power within relationships and early sexual exposure would increase their risk of HIV. On the other hand, factors such as early marriage*

and being currently in monogamous relationships should provide more of a protective effect.

H3b. For high SES women, I expect that delayed marriage, having multiple partners (infidelity), longer years of premarital sexual exposure and partner's SES will be a significant driver in predicting HIV risk for these group of women.

Low SES-HIV Pathway

Figure 6-1 illustrates the statistically significant relationships that exist between HIV and being in low SES category for women in Cameroon. Important pathways are highlighted with bolded arrows, while only factors that significantly increased or decreased risk for low SES women are also highlighted.

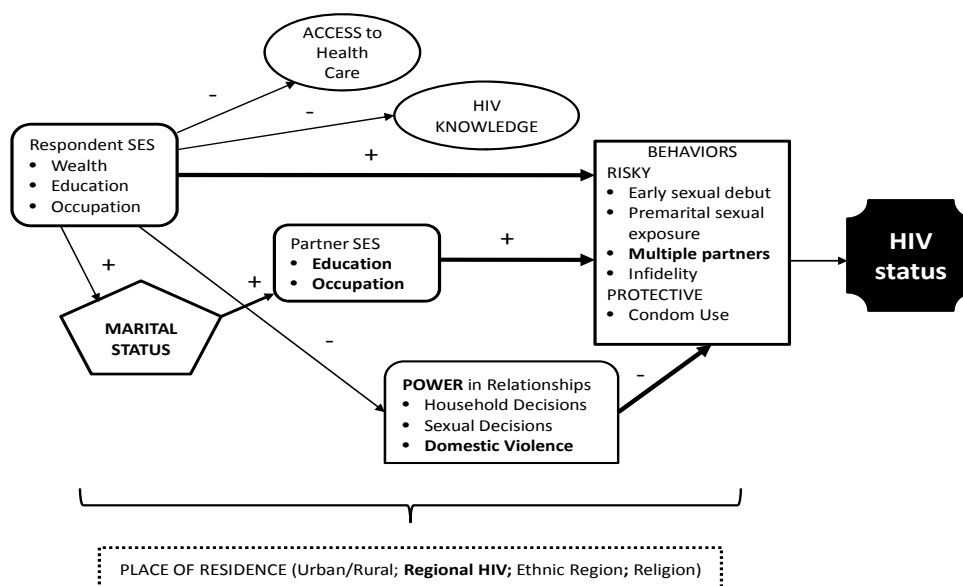


Figure 6-1: Model of Significant HIV Risk Factors for Low SES Women

My results do indicate some interesting patterns of risk for low versus high SES women. Most of the traditional determinants expected by classic epidemiology studies – such as limited power within relationship and early sexual exposure – were not significantly associated with HIV risk among low SES women. Even patterns of early marriage, which were prevalent among low SES women, failed to reach the criterion for statistical significance in my models. What seems to be the most significant risk factor for low SES women was her partner's occupation and education and whether or not she had more than one sexual partner in the last 12 months. The combination of being in a low SES household and having a partner in a professional/white collar profession or with secondary or higher education most significantly influenced their risk of being HIV positive. This may be because respondent and partner education are highly correlated and the few women who married someone not in their education bracket were exposing themselves to sexual practices and cultural expectations from their highly educated partners that increase their risk significantly.

Surprisingly, not having access to medical help among low SES women did not increase risk; rather this group of women had lower odds of testing positive for HIV (even at the bivariate level). Also consistent with bivariate analysis was the fact that women in the low SES category had lower mean scores of HIV knowledge but also had lower rates of HIV infection. Furthermore, this group of women was more likely to be tolerant of wife beating at the bivariate level as well as have lower domestic decision making powers within their respective households. However, at the multivariate level neither indicators of female power were associated with HIV risk among low SES women.

High SES-HIV Pathway

Figure 6-2 below illustrates the statistically significant relationships that between HIV and being in high SES category for women in Cameroon. Important pathways of HIV risk (represented by arrows) and factors that reach statistical significance and increased or decreased risks of HIV for high SES women are highlighted and bolded.

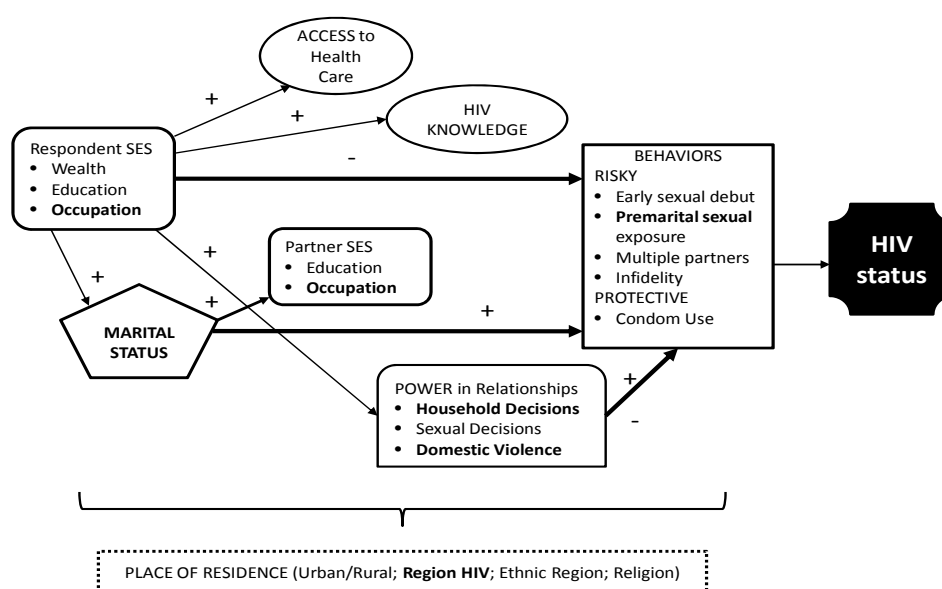


Figure 6-2: Model of Significant HIV Risk Factors for High SES Women

For women in higher SES households, as expected, longer years of premarital sexual activity did increase their risk of being HIV positive, however, partner's SES failed to show any significant association with HIV status. The positive effect of longer years of premarital sexual exposure on a woman's risk of HIV was expected for this group of women as they were more likely to delay marriage despite being sexually active.

Higher SES women were also more likely to be cohabiting or formerly married, both of which were associated with higher HIV rates.

On the other hand, behaviors that were expected to be significant drivers of HIV risk for this group of women (such as condom use, infidelity, or having multiple partners) failed to reach statistical significance in the multivariate models. One of the more surprising findings was that increased decision making authority within household was associated with increased risk rather than decreased risk for women with high education. Conversely, women in high SES households who were less tolerant of wife beating (an indicator of more power in their relationships) were less likely to be HIV positive. Net the effects of other variables, the models suggest that among high SES women, those working in professional/white collar professions had reduced HIV risk, which contradicts the literature and my expectations. Though failing to reach the criterion of significance at the multivariate level, bivariate patterns for high SES women show that having increased access to medical help or increased knowledge of HIV and prevention methods was significantly positively related to their HIV status.

Medium SES-HIV Pathway

Figure 6-3 below illustrates the statistically significant relationships that exist between HIV and being in medium SES category for women in Cameroon. Important pathways of HIV risk (represented by arrows) and factors that reach statistical significance and increased or decreased risks of HIV for medium SES women are highlighted and bolded.

Interestingly, results indicated that women with intermediate SES (e.g., those in medium wealth households and with a primary education) may account for much of the positive association seen between SES and HIV. Having a primary education for women in the medium wealth group and being in a medium wealth household with a primary education combined to significantly raise the risk of testing positive for HIV. For intermediate SES women, partner's occupation also influenced their HIV status.

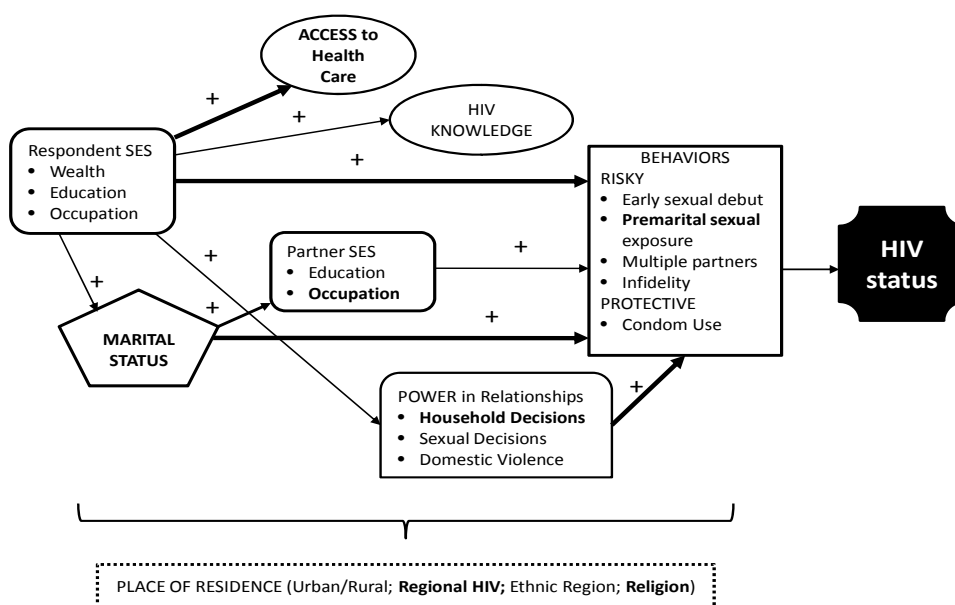


Figure 6-3: Model of Significant HIV Risk Factors for Medium SES Women

Overall, most of the counter-intuitive results described above are most common among this group of women. For example having accessed a health care facility in the last 12 months was significant and positively associated with HIV. Conversely, women in the medium SES category facing any barrier to accessing health care services showed

significantly lower odds of testing positive for HIV. Moreover, commanding higher domestic decision making power within medium SES households significantly increased the odds of testing positive for HIV. Compared to Catholics, Protestant women in the medium wealth index had increased odds of testing positive for HIV.

Taken as a whole, results from the stratified multivariate analysis suggest that hypotheses H3a and H3b are not well supported by the evidence from Cameroon. Important pathway such as link between knowledge of HIV and sexual behaviors failed to reach criterion for statistical significance. The pathways of risk for low SES women were not more likely to follow conventional epidemiological expectations, and the higher SES women tended to have similar risk factors as the other SES groups. In both cases, it is clear that socioeconomic status is related in expected ways to intermediate variables (such as access to health care, knowledge about HIV, and power in relationships). However, the unexpected relationships between these factors and HIV were often more accounted for by low or medium SES women than among the higher SES group.

Implications

My results indicate that the relationship between SES and HIV remains complex. As expected, as Cameroonian woman's SES rises, she is more likely to have access to medical help, command higher knowledge of HIV and HIV prevention methods and to use condoms as protective behavior. However, there appears to be a broken link between all of these protective factors and risk of HIV. This study therefore contradicts major theoretical expectations about infectious disease risk as women in the higher wealth groups (rather than lower wealth women) still have disproportionately higher rates of

HIV infection in Cameroon. Multivariate analyses indicate that these results may be a function of persistent behavioral factors in which risky behaviors (in particular, premarital sexual exposure) continue to place women in high SES groups at greater risk of HIV in Cameroon.

Several additional factors could account for this positive association between a woman's wealth and HIV status. My analysis shows that wealthier women in Cameroon were more likely to live urban areas, and bivariate analyses show that HIV is more prevalent in these areas. This highlights the potential importance of context in explaining patterns of HIV infection. Studies have suggested that there is a significant association between neighborhood characteristics and a woman's HIV status (Gabrysch et al., 2008). In the Cameroonian case, it may just be that higher SES woman who live in urban areas with higher rates potentially will have higher risk because the social and sexual networks with which they interact already have higher rates of HIV and serve as a high 'risk group'. Similarly, the persistent influence of variables in the models to reflect a respondent's region suggests that contextual effects associated with regionally variable background HIV rates are important drivers of risk patterns for individual women (net of the effects of other variables included in this study).

Some of the factors that seem to put women at risk of HIV irrespective of their SES, such as risky sexual practices make logical sense. In fact Gabrysch et al. (2008) found the same pattern in their research done in Zambia. They found that having multiple life time partners or multiple partners in the previous 12 months increased risk for girls in Zambia. Similarly, being unfaithful to a partner increased the risk of HIV infection for women in the CDHS. On the hand, factors that were theoretically supposed to reduce

HIV prevalence or the risk among women in showed unexpected results. The positive association between knowledge of HIV and HIV prevention methods and positive HIV status was quite unexpected. The literature suggests that increased knowledge of HIV will allow individuals the know how to prevent infection and lead to safer sexual behaviors (or if they are infected, how not to spread the disease). Of course, it is highly unlikely that higher knowledge actually puts women at increased risk. Rather, I suspect that the positive association between knowledge and HIV reflects ‘reverse causality’ through which women who have already contracted HIV may then develop better knowledge of the disease, be more inclined to use condoms, and/or be more likely to visit health care facilities. On the other hand, although women with more knowledge and access to medical care were more likely to use condoms (which are deemed protective), they were also more likely to practice behaviors such as alcohol use during sex, infidelity, and sex with multiple partners. Considering that the rates of condom use was generally very low, the persistence of risky behaviors (despite high HIV knowledge) appears to counteract any protective effect that condom use should have had.

Other counter intuitive findings may reflect larger socio-cultural processes that place high SES women in SSA at greater risk of exposure to HIV. For example, the literature argues that the more power a woman wields in her relationship, the more likely she will be able to negotiate safer sexually practices, thereby lowering her HIV risk. But what the Cameroonian results indicate is that having more decision power does not necessarily translate to less risk of HIV (and in the case of high SES women, higher rates of household decision-making authority was actually associated with higher HIV risk). Two explanations of this odd pattern are possible. First, it is possible that the power–

HIV relationship in my sample is spurious and merely a reflection of a common association with socioeconomic status (which we know is positively related to both power as well as riskier sexual behaviors and higher HIV rates). Alternatively, the indicators of ‘power’ available in the CDHS may inadequately capture the actual degree of power Cameroonian women have to influence the behavior of their partners. Even if women know more about how to protect themselves, and even if they feel more ability to influence domestic household decisions, they may still lack the ability to challenge their partners to reduce risky behaviors (like infidelity) or to adopt protective behaviors (like condom use).

Overall, one of the most important determinants of risk for Cameroonian women (especially low SES women) is her partner’s SES. We know that heterosexual marriages predominantly occur between individuals of the same socioeconomic circumstances. While the CDHS does not include direct measures of a woman’s partner’s sexual behaviors, the research literature from SSA indicates that high SES men are more likely to practice riskier sexual behaviors, especially use of commercial workers, due their disposable income and increased ability to travel (Mishra et al., 2007a). It can be argued that for men in most Sub-Saharan countries “the socioeconomic and life style factors that accompany education and increase the risk of exposure to HIV have not been counterbalanced by changes in behavior that would decrease HIV risk” (Hargreaves and Glynn, 2002:496). The present analysis indicates that increased risk for HIV for women in the CDHS is associated with not only her partner’s educational status but also his occupation, lending more evidence to this theory. In their study of HIV patterns among men in the 2004 Cameroon DHS, Kongnyuy et al. (2006) found that wealthy men were

less likely to have used a condom in their last sexual intercourse with a non regular partner, more likely to have had multiple concurrent partners, and more likely to have had more than five lifetime partners. This however, was true only for low SES women, indicating that having a partner outside of their SES index significantly increased the probability they would test positive for HIV.

The impact of marital status focuses our attention on the heightened risk of HIV among women who are formerly married or are in cohabiting unions. This result echoes similar studies done in Cameroon and in South Africa. Shisana et al. (2004) found that in South Africa, currently married people were less likely than unmarried people to be infected with HIV. In our study of Cameroonian women (Reither and Mumah, 2009) we also found that widowed and cohabiting women had the greatest risk for HIV net of other risk factors. For women in cohabitating unions, perhaps the lack of legal commitment gave not only their partners but themselves greater opportunity to engage in risky sexual behaviors. Cohabiting women were more likely than married women to report infidelity and having multiple sexual partners. Nkuo-Akenji et al. (2007) found that Cameroonian women at the university level believed that an important means of preventing HIV and other STDs was limiting the number of sexual partners. However, this same group of women believed that having multiple sexual partners was acceptable, which might help explain why higher SES women were more likely to engage in such behaviors and were more vulnerable to HIV. For formerly married women, there is the possibility that being widowed, divorced, or separated is directly linked to previous HIV infection (either for the woman or her partner). It may be that they lost their partners to the diseases and therefore more likely to have been infected from a late spouse (for widowed women), or

that they are now divorced and separated because they found out they (and/or their partner) were HIV positive.

Although indicators for age at first marriage was initially significant in the component model, once other factors were controlled for it no longer served to predict HIV risk. Ongoing debates in the literature about the impact of early marriage on the risk of HIV suggest that the protective effect of reducing years of sexual activity prior to marriage may outweigh the risk of young women marrying much older men who are more likely to carry the virus. According to Clark (2004), the age of their partners is what puts girls who marry early at greatest risk. In her study in Zambia and Kenya, spouses of adolescent girls were 2 to 3 times more likely to be HIV positive. In my analysis, the protective effect of early marriage (seen when no other covariates are in the model) supports Bongaarts' theory (2006) that early marriage may provide some protection because of the shorter years of sexual activity before their first marriage. In fact Adair (2008) in his study of HIV and age at first marriage among Cameroonian women found the same result, as women who married above age 20 were more than two and a half times more likely to test positive for HIV, compared to women who married below age 16. This is substantiated by the fact that after controlling for all other covariates in the model, an additional year of premarital sexual activity increases risk of testing positive for HIV for women in Cameroon by 7 percent. Similarly, women whose marriage occurs after the age of 20 are increased risk of HIV due to the longer number of years of premarital sexual activity.

One of the more surprising results that stayed robust throughout the bivariate and multivariate analysis (even after controlling for other covariates) was the significant

positive relationship between domestic household decision making authority and higher risk of HIV. I had anticipated that having some amount of power within the relationship will be an indication of a woman's ability to negotiate better sexual practices with their partners especially increased use of condoms. This suggests that the traditional benefits of more power within relationships cited in the research literature have yet to translate into changes in sexual behavior among women in Cameroon. This supports the finding of Msamanga et al. (2006) that women in Tanzania who reported having their own income, and who should theoretically be able to demand the use of condoms from their partners by virtue of their economic independence, had higher rates of HIV. On the other hand, my findings did confirm that women who had attitudes that were more tolerant of wife beating (net of the effects of other factors) were also more likely to have HIV – particularly among women in high SES households. This suggests that traditional cultural norms continue to play a huge role in sexual attitudes, beliefs, and behaviors among even high SES women.

Though unable to present direct evidence in this study, another factor that might explain the positive SES-HIV relationship is the fact that wealthier individuals are likely to live longer in the event they contract HIV because of their access to better nutrition and health care services (Mishra et al., 2007a). Some of the observed high rates of HIV among high SES women in the CDHS could reflect the fact that they are living longer with the disease, while low SES women with HIV may have already passed away from the illness.

Study Limitations

The goal of this study was to determine the main determinants of HIV risk and to see if these determinants varied by the socioeconomic status among women in Cameroon. While my results shed important light on aspects of this relationship, the study has some important limitations that need to be acknowledged.

First, the cross sectional nature of the data provides a limitation because it can only demonstrate statistical associations and not temporal causal processes among potential predictors and HIV infection. Some researchers have argued that HIV infection may occur before certain behaviors. This may actually be the reason why higher knowledge of HIV and HIV prevention methods, visiting a health facility or even the use of a condom is associated with positive HIV status. In addition, I cannot distinguish cases where SES causes greater HIV risk from those where HIV status might impact a woman's SES. The literature clearly indicates that the impact of chronic and infectious diseases like HIV on individuals' economic well-being can be significant (UNAIDS, 2000). That said, if HIV were causing lower socioeconomic status, we would have expected to see greater HIV rates among lower SES women, which was not the case for the CDHS sample. As noted above, the fact that higher SES women are likely to have access to better nutrition and anti-retroviral (ARV) drugs could explain some of the heightened rates of HIV among higher SES women in this cross-sectional sample.

Other limitations relate to the operationalization of specific variables using the CDHS. One of the biggest limitations is that there is no direct measure of partner sexual behaviors which I believe are critical factors in explaining higher rates of HIV among upper SES women. The fact that I am only looking at women may be telling one side of the story. My study does indicate that relationship status and sexual behaviors are major

drivers of HIV risk. Being unable to link partner's behavior to and the resultant effect on women's risk of HIV is a major limitation. I can only speculate based on theory how partner's behaviors might impact female risk and vice versa. However, considering that women in Cameroon have HIV rates that double those of men, my focus on explaining patterns of HIV among women is an important side of the story to tell and a good starting point for research on this topic.

Another limitation of this study is that predictors such as sexual behaviors are self-reported. Many researchers have argued that women in Sub-Saharan Africa usually under report either their premarital or their extramarital sexual activity (Zaba et al., 2002). Furthermore, studies in most African countries have often found a weak association with self-reported risky behaviors (Mishra et al., 2007a) and this is substantiated by the lack of significant results for some behavioral indicators in my bivariate and multivariate analyses. As Buve et al. (2001) argue, findings using self-reported data may be biased to the extent that infidelity to a partner, total number of partners, and condom use are misreported by women in a pattern that varies across the different SES groups. Less critical, though potentially important, when measuring SES I was restricted to variables reported in the CDHS (education, occupation, and household asset wealth), and did not have access to continuous measures of individual or household income. As Mishra et al. (2007a) note, the existence of a large informal economy and self-provisioning by agricultural households can make it quite difficult to collect reliable data on income and household expenditures in developing countries. As a result surveys like the CDHS often rely on more easily measured indicators of household assets.

I was also unable to directly measure important theoretical concepts such as gender violence. Gender violence is currently argued to be one of the main determinants of risk of HIV among women in Sub-Saharan Africa (Dunkle et al., 2004; Kathewera-Banda et al., 2005), but unfortunately this study is only able to use proxy measures to capture the broader cultural and institutional factors that systematically make women more vulnerable to economic and health risks.

Conclusion

Overall, this study demonstrates that the relationship between SES and HIV is very complex and fails to confirm conventional assumptions that low SES women are at increased risk of HIV. This study indicates that low SES women overall tend to have lower rates of HIV, albeit still rates much higher than found in the United States. Many of the expected benefits of greater economic resources are found among higher SES women in Cameroon (such as higher levels of formal education, greater knowledge of HIV, increased access to health care services, and more progressive ideas about the role of women in marital relationships). However, being in a high SES situation has not necessarily translated into more effective negotiating power within their respective relationships. High SES women in Cameroon continue to practice risky behaviors and appear to be unable to get their partners to practice protective behaviors (such as use of condoms).

This suggests that the mechanism that most increases risk of HIV for high SES women maybe combination of personal sexual behaviors and inability to get partners to use condoms. My study shows that condom use is very low and any benefit could come

from it may be offset by increased riskier sexual behaviors on the part of wealthier women. What we are therefore seeing is that even among higher SES women (who have better access to formal education and better economic assets), the benefits of increased access to resources have not translated to mechanisms that reduce their risk. My findings suggest that high SES women are mostly at risk from their own sexual behaviors, especially the number years she was sexually active before her first marriage. Results show that women in the high SES strata did indeed have all the benefits associated with increased resources (higher knowledge of HIV and HIV prevention methods, increased access to health care and health care facilities, and higher decision making power) but because of persistent risky behaviors such as longer years of premarital sexual exposure, their higher risk of HIV persisted. One crucial pathway that failed to reach statistical significance in this study was partner's SES, which previous literature indicated will be significant determinant of HIV high SES women. One possible explanation is that there is lack of variability within the SES groups, thus not able to significantly capture the within SES differences, thereby explaining the nonsignificant results obtained. However, the significant result seen between HIV risk for low SES women and partner's SES indicates that this study could most likely be capturing overall group risk.

Conversely, for Cameroonian women in the low SES groups, what seems to be the mechanism of increased risk is not necessarily poverty but relative gender inequality. Having a partner in a higher SES significantly increased risk, indicating that having a partner outside of their SES bracket limited their ability to curb risk sexual practices of high SES partners, which we already know increases with education and wealth. This

finding reinforces Sen's capabilities approach to development where he argues that continued gender inequality presents a significant constraint to real social, cultural, economic, and political progress in the developing world. In this sense gender inequality at the societal level can limit women's choices or ability to alter their behaviors, be it theirs or that of their partners. Among low SES women, having a partner with a higher education, increased their risk tremendously, indicating that having a partner outside of their SES bracket limited their ability to curb risky sexual practices of high SES partners, which we already know increases with education and wealth.

To really tackle the HIV crisis in Cameroon, there needs to be some form of a cultural shift in expectations for both men and women. In most of Sub-Saharan Africa multiple sexual partners are condoned (or even encouraged) for men but not for women. However, if both partners were to live more protective sexual lives, we may see a reduction especially among formerly married women whom may have lost their respective partners due to contraction of the illness. Moreover targeting this group could be a tremendous tool in reducing the spread, as they are likely to have future relationships and teaching them the science behind the illness might help curb spread that may eventually emanate from this group of women. Hargreaves et al. (2002:800) put it more succinctly when they write that "cultural background does not determine behavior but it does provide the social actor with a framework for making decisions." Because apparent power within relationship doesn't seem to translate to negotiating power over sexual matters for women, targeting men may increase the success rates of HIV related campaigns.

The results of my study also suggest that poverty reduction programs alone may fail to treat the root causes of the problem. On the one hand, the reason many women are poor in the first place is highly related to gender inequality. To this effect, even if policies give women more access to resources, if they lack the social and cultural support framework to enact changes in their lives, increased access may not have much effect on their health risks. Ultimately, if a woman with increased access to resources is unable to ask her partner to use a condom or leave a risky relationship, such programs are unlikely to tackle the underlying causes of HIV in SSA. It is worth reiterating that poverty reduction policies are still vital to development efforts and the fight against the HIV pandemic. Among the poorest women, their economic dependence is likely to exacerbate their vulnerability such that they too lack the leverage the need to change their circumstances without having to engaging in behaviors that might increase their risk. It is also clear that efforts to spread information about HIV and better access to testing and treatment for the disease are necessary preconditions to motivating women to engage in more protective behaviors. However, poverty alleviation, education, and health care service programs alone are unlikely to provide the cultural and behavioral changes required to empower women to make healthier choices within their intimate relationships.

The fact that high SES women in Cameroon seem to be at particularly risk for HIV means that a complementary policy approach is required that targets wealthy women specifically. Such a program needs to explore mechanisms to create cultural shifts that alter sexual norms and practices among otherwise relatively well-off women in SSA. While poverty reduction efforts need to continue, a campaign targeting individuals in the high wealth index could be intensified.

Regardless of why people contract HIV, it remains important to continue to work on de-stigmatizing HIV/AIDS so individuals with the disease can better access health facilities and treatment. The overall rate of use of CPDV clinics remains very low in Cameroon. Low utilization reflects both cultural and institutional factors. One of the biggest reason spread of HIV has not been curbed is that people do not know their HIV status. Many are afraid to get tested because of the repercussions of the result, especially if they are HIV positive. Evidence also suggests that there are not enough centers in Cameroon to handle testing and counseling of HIV/AIDS, particularly in rural areas (Ngwakongniwi and Quan, 2009). The results presented here suggest that the majority of respondents who had not heard of a CPDV centers were women with little wealth, no formal education, and who lived in rural areas. An expansion of these centers in rural areas, as well as campaigns encouraging their use, should help prevent the spread of HIV into parts of Cameroon where it is presently less widespread. Combined with the low usage of condoms in Cameroon, not knowing one's status is a fatal combination that can be controlled if people are encouraged to use the testing and counseling centers that are available.

Ultimately, the positive association between SES and HIV in Cameroon in 2004 may reflect the early phase of an HIV pandemic that has first affected wealthier and better educated people because of sexual behaviors and cultural practices that placed them at greater initial risk. It has been argued that as the disease matures and the impacts become clearer, higher SES people will practice sexual behaviors that will reduce their risk of being HIV positive. At the same time, the expectations of traditional epidemiology may yet come to pass as the disease becomes more common in lower SES and more rural

communities, where knowledge about HIV and access to health care services are much lower, and traditional gender roles remain dominant. Future research could test whether Cameroon in 2004 represented an early stage in a complex transitioning process. Analysis of the next wave of DHS data from Cameroon could provide a productive avenue to continue this research by comparing the dynamics of HIV risk over time.

Finally, the significant role of context as seen by the consistently significant value for regional HIV rate underscores the importance for the need to prevent spread across regions. Context was significant especially for low SES women, suggesting that context could be used to target areas, especially as low SES women were more likely to be found in rural areas, where facilities are inadequate to handle the HIV cases.

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CURRICULUM VITAE

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CAREER OBJECTIVE

To obtain a research position in a competitive institution or research organization that will allow me to focus my energies on research, scholarship and professional growth. Special areas of interest include: reproductive health, marriage, gender and education, African development, and socioeconomic determinants of health.

EDUCATION

- | | |
|-----------|---|
| May 2011 | Ph.D. Sociology
Utah State University, Logan, Utah
Specialty Areas: Social Change & Development and Demography
Dissertation Topic: <i>Socioeconomic Status, Women and HIV: Do the Determinants of Female HIV Vary by SES in Cameroon?</i>
Advisor: Dr. Douglas Jackson-Smith |
| June 2006 | M.A. Public Affairs with a concentration in Applied Sociology
New Mexico Highlands University, Las Vegas, New Mexico
Thesis: <i>Globalization and its Impact on Marriage among the Wimbums</i>
Advisor: Dr. Erika Derkas |
| July 2003 | B.Sc. Sociology and Anthropology with minor in Political Science
University of Buea, Cameroon
Undergraduate Thesis: <i>Marriage among the Wimbums of Northwest Province, Cameroon</i>
Advisor: Dr. Akoko Robert |

RESEARCH INTERESTS

Independent Research Experience

Research for PhD dissertation entitled “Socioeconomic Status, Women, and HIV: Do the Determinants of Female HIV Vary by SES in Cameroon?” This includes multivariate data analysis of large scale complex data, made available by the Demographic and Health Surveys.

Research conducted originally for undergraduate thesis and expanded for Master’s thesis entitled “Marriage among the Wimbings of Northwest Province, Cameroon.” Conducted fall 2002-summer 2005. Included conducting In-depth interviews, data transcription and analysis, and Participant Observation.

Graduate Research Assistant

2010-2011 **Graduate Research Assistant, Utah State University, Dr. Douglas Jackson-Smith**

Dissertation Project: “Women, HIV and SES: Do the Determinants of HIV Vary by SES in Cameroon? Evidence from the 2004 CDHS.”

Summer 2007 - **Graduate Research Assistant, Utah State University, Dr. Douglas Jackson-Smith**

Fall 2009 Supervised a team responsible for implementing a large scale mail survey with a sample of over 6400 households from 8 counties. Duties Included supervising all aspects of the survey implementation process (preparation, multiple waves of mailing, tracking and coding of returned surveys, data analysis). The analysis of data included the use of SPSS (Social Science Statistical Package). I was also responsible working with data collected for a project examining the research needs of water scientists throughout the Western United States. This required me to work with data entered into NVIVO (qualitative data analysis software).

Summer 2008 **Graduate Research Assistant, Utah State University, Dr. John Allen**

Part of a community research team responsible for implementing a small scale survey of towns in Utah. Aim was a better understanding of the changes being faced by rural communities and citizens in the state. Duties included supervising all aspects of the survey implementation process (preparation, multiple waves of mailing, tracking and coding of returned surveys).

- Fall 2006- **Graduate Research Assistant, Utah State University, Dr. Maki Hatanaka**
- Spring 2007 This project involved working on research dealing with Third Party Certification, Labeling and Accreditation in the Global South. Duties included literature search, library search and literature review of articles found. Other projects included working on sustainable seafood provided by restaurants. This included collecting data by fact checking menus of restaurants who claim to follow the Monterey Bay Aquarium National seafood watch guide. Purpose of this project was to check if these restaurants were green washing or not.
- Summer 2005 **Graduate Research Assistant, New Mexico Highlands University, Dr. Erika Derkas**
Project Worked on Gender and Violence in Las Vegas, New Mexico. This project required the transcription of more than twenty-five in-depth interviews.

PUBLICATIONS

Peer-Reviewed Publication:

Reither, Eric and Mumah, Joyce. "Educational Status and HIV Disparities in Cameroon: Are the Uneducated Women at Reduced Risk?" *African Population Studies*. 2009. Vol. 23 (S), pp.127 - 140.

Manuscripts in Development for Peer Review

Mumah, Joyce. "Do the Determinants of HIV Vary by SES in Cameroon? Evidence from the 2004 CDHS."

Mumah, Joyce and Derkas, Erika. Modernization or Globalization: Understanding Changes to Marriage among the Wimbums."

PROFESSIONAL PRESENTATIONS

Conference Presentations

Mumah, Joyce. 2011. "Do the Determinants of HIV Vary by SES in Cameroon? Evidence from the 2004 CDHS." Paper to be presented at the Western Social Science Association 53rd Annual Conference, April 13-16, Salt Lake City.

- Mumah, Joyce. 2010. "Socioeconomic Status and HIV: Do the Mechanisms that put Females in Cameroon at Increased Risk differ by SES?" Paper presented at Annual Intermountain Graduate Student Paper and Poster Symposium; Logan Utah, March 31st 2010.
- Mumah, Joyce. 2009. "Bridewealth and Dowry: Social Exchange vs. Feminist Perspective" Paper presented at the 80th Pacific Sociological Association, San Diego, California.
- Mumah, Joyce. 2009. "Bridewealth and Dowry: Social Exchange vs. Feminist Perspective" Paper presented at Annual Intermountain Graduate Student Paper and Poster Symposium; Logan Utah
- Mumah, Joyce and Reither, Eric. 2007. "Educational Status and HIV Disparities in Cameroon: Are the Uneducated Women at Reduced Risk?" Paper presented at the 5th African Population Conference, December 10-14 in Arusha, Tanzania.
- Mumah, Joyce. 2006. "Globalization and its impact on marriage among the Wimbums" Paper presented at the Pacific Sociological Association, Hollywood California.
- Mumah, Joyce. 2005. "Marriage among the Wimbums" Paper presented at the Pacific Sociological Association, Portland, Oregon.

Panel Presentations

- December 2010. Member of panel organized by Black Student Union-Utah State University, in honor of World AIDS Day. Theme: "Condom and Coffee", Utah State University.
- August 2009. Member of panel organized by Cameroon Students Association-USA (CAMSA-USA). Theme: "Emerging Issues: Cameroonian Students in the wake of HIV/AIDS", Dallas, Texas.
- November 2008. Member of Panel organized by African Student Association-Utah State University (AFSA). Theme: "The Effects of Religion and Culture on Africa's Development", Utah State University.

OTHER PROFESSIONAL EXPERIENCES

- 2009 - 2011 **Tutor/Academic Skills Mentor, Athletic Department, Utah State University.**
Duties were primarily tutoring a variety of sociology classes from introductory sociology classes to upper division sociology classes, as well as serving as a mentor to individual athletes.
- 2005 - 06 **Work-Study for International Education Center, New Mexico Highlands University.**
My duties included processing admission documents for international students, maintaining and updating student files, initiating and maintaining contact with prospective students in different countries via phone or e-mail. I was also the liaison between international students and international education center.
- 2006 **Member of Student Recruitment Trip to Cameroon, New Mexico Highlands University.**
I was part of a 3-person delegation which included the Dean of the School of Business and the Director of International Education. The team traveled to Cameroon for 3 weeks visiting schools in 4 regions, introducing the school to prospective Cameroonian students. We also visited the American Embassy in Cameroon.
- 2006 **Student Orientation Leader New, Mexico Highlands University.**
I took part in six orientation sessions and was in charge of at least 50 students per session. As the leader of the group, I was in charge of coordinating my team as well as getting the students through the orientation activities. The task also included peer to peer advising with the students with follow up via phone later.
- 2004 **Development Worker, Plan - Cameroon.**
With Plan I received training on Plan's systems and procedures including their formal Planning, Monitoring and Evaluation system used in participatory Rural Appraisal Techniques. I undertook various short term field assignments in 36 villages in the central province of Cameroon. Field assignments included organizing focus groups discussions, sometimes by gender and gathering data and writing a report based on activities that went on that day. The data and reports were later used in developing 5 year development plans for the villages.

- 2002 **Internship with the Ministry of Higher Education in Yaoundé, Cameroon.**
 Worked with the student programs Director and had among other tasks to coordinate student activities with the ministry. At the end of the internship, I drafted a report for the Sociology department of University of Buea.

PROFESSIONAL TRAINING

- 2004 **Corporate Planning, Monitoring, and Evaluation in the use of Participatory Rural Appraisal Techniques, Plan, Cameroon**
 With the Population Rural Appraisal Techniques I worked in 36 villages holding focus group discussions with various sub-groups within the villages in order to get their knowledge, opinions about the various developmental programs as well as their participation in the implementation of these developmental projects.
- 2004 **Baseline Surveys in Health –HIV/STDs - Plan, Cameroon**
 With the baseline surveys I worked in numerous villages collecting data on maternal and child health. This specific survey collected data on sexual reproductive health with the aim of implementing reproductive health programs with special emphasis on HIV/STDs, among vulnerable populations-women.

TEACHING INTERESTS

Social Change and Development
 Social Demography
 Social Problems
 Women and Development
 Population and Health
 Gender
 Social Statistics

TEACHING EXPERIENCE

Lead Instructor:

On-Campus Courses Taught

- | | |
|----------------|--|
| Fall 2008 | <p>Social Problems (SOC 1020): Department of Sociology, Social Work and Anthropology, Utah State University</p> <p>Created and taught a large introductory level undergraduate course on societal problems required for students minoring in sociology. The course introduced students to a wide variety of sociological topics ranging from problems associated with health to inequality, globalization and gender. The course examined how issues became problems and ways in which groups attempt to solve these problems</p> |
| Spring 2010 | <p>Developing Societies (SOC 5650): Department of Sociology, Social Work and Anthropology, Utah State University</p> <p>Created and taught an upper level course on developing societies, designed to provide students with critical analyses of development processes as well as the impacts of these development efforts on poor regions. This class focused on developing societies with special attention paid to Sub-Saharan Africa, the HIV/AIDS crises, gender inequality as well as the linkages between international and intra-national inequality.</p> |
| Fall 2011/2010 | <p>Social Statistics (SOC 3120): Department of Sociology, Social Work and Anthropology, Utah State University.</p> <p>Created and taught an undergraduate level course on social statistics, designed to make students familiar with the basic quantitative statistical methods in the social sciences. The objective of the class was to help students gain greater insight into the everyday use of statistics. Given the fact that students will at some point in their lives be exposed to decisions that may indirectly or directly involve the use of statistical techniques, the class allows students to be well acquainted with the concepts in such a way that they will be able to organize, summarize, and communicate the information they are exposed to.</p> |
| Fall 2011 | <p>Introduction to Sociology (SOC 1010): Department of Sociology, Social Work and Anthropology, Utah State University.</p> <p>Created and taught a large introductory sociology class. This introductory class was designed to introduce students to a wide variety of sociological topics ranging from the sociological imagination, theory, gender, social stratification to race and ethnicity. This course looked at these various topics from a global perspective, so as to allow students see the world through a global lens.</p> |

Distance Education Classes Taught

- Summer 2010 **Introduction to Sociology (SOC 1010): Department of Sociology, Social Work and Anthropology, Utah State University.**
 Created and taught a large introductory sociology class for distance education. This introductory class was designed to introduce students to a wide variety of sociological topics ranging from the sociological imagination, theory, gender, social stratification to race and ethnicity. This course looked at these various topics from a global perspective, so as to allow students see the world through a global lens.
- Summer 2011 **Social Statistics (SOC 3120): Department of Sociology, Social Work and Anthropology, Utah State University.**
 Will Create and teach this undergraduate level course on social statistics for distance education. The class will be designed to make students familiar with the basic quantitative statistical methods in the social sciences. The objective of the class was to help students gain greater insight into the everyday use of statistics. Given the fact that students will at some point in their lives be exposed to decisions that may indirectly or directly involve the use of statistical techniques, the class allows students to be well acquainted with the concepts in such a way that they will be able to organize, summarize, and communicate the information they are exposed to.

Teaching Assistant

- Fall 2006/
 Fall 2007 **Teaching Assistant-Utah State University, Dr. Sandra Marquart- Pyatt, Dr. Mike Toney & Dr. Susan Mannon**
 As a teaching assistant I worked as a TA for several professors. My tasks usually included grading, providing logistical support, preparing power-point lectures and providing extra help to students. My TA assignments included the following courses:
 - Women in Development (Dr. Susan Mannon)
 - Social Research Methods (Dr. Mike Toney)
 - Social Psychology (Dr. Sandra Marquart-Pyatt)
- Spring 2006/
 Fall 2004 **Teaching Assistant- New Mexico Highlands University, Robert Mishler and Dr. Thomas Ward**
 As a teaching assistant I led five discussion sessions in Introduction to Anthropology and held laboratory sessions with students in Introduction to Sociology. I also had the tasks of grading, keeping grades and holding office hours for students.

PROFESSIONAL MEMBERSHIPS

2011	Member- American Sociological Association
2011	Member- Western Social Science Association
2008	Inducted into the Golden Key International Honor Society
2007-present	Member - Union for African Population Studies
2007-present	Member - Population Association of America
2005-present	Member - Pacific Sociological Association
2006-present	Inducted into the Honor Society of Phi Kappa Phi

SERVICE

Summer 2009	Volunteer- Center for Pregnancy Choices- Logan, UT
2009 - 10	Director of Diversity - Golden Key International Honor Society- Utah State University Chapter
2008-09	<p>Vice President - African Students Association (AFSA) - Utah State University</p> <p>I was primarily in charge of organizing the annual African Student's Banquet which is the showcase of cultures from the different African countries, in the form of traditional dances, food, fashion and so much more.</p>
2007-09	<p>Chair, Education Committee - Cameroon Students Association in the USA (CAMSA-USA).</p> <p>During my tenure, we successfully collected and shipped over 15000 books to various libraries in Cameroon. We also forged a successful relationship with the Peace Corps and other organizations in Cameroon to facilitate book donations. We were successful in raising enough money to give out scholarships to needy students in the USA, as well we successfully organized two Panel discussions "<i>Emerging Issues: Cameroonian Students in the wake of HIV/AIDS</i>" and "<i>Immigration and Diaspora: Finding the American Dream</i>" during the annual Cameroonian conventions in Houston, Dallas and Minneapolis respectively.</p>
2007-08	<p>Vice President - Cameroon Students Association in the USA (CAMSA-USA).</p> <p>My duties included but were not limited to getting funds for the current book projects and to ship books to the state universities in Cameroon as well as organizing the annual convention that was held in Dallas in August 2008.</p>

- 2005-06 **Senator –Associated Students of New Mexico Highlands University**
Was on various committees such as Governmental Affairs and Presidential Appointments. We had the task to lobby the Senate in Santa Fe for money to aid with students' transportation for the school.
- 2005-06 **Vice President - New Mexico Highlands University International Club**
As Vice-President, some of my responsibilities included organizing an annual show *The Gathering of Nationalities*, which is a show case of the different cultures from international students, the annual spring Break trip (we took trips to Florida and Nevada), as well as organizing fund raising programs for the association.
- 2005-06 **Treasurer of Association of Sociology- New Mexico Highlands University**
Was in charge of handling the clubs money and fundraising for Sociology graduate students to attend academic conferences.
- 2002-03 **Secretary General of Network Association for Sociology and Anthropology students (NASA) in West Africa, University of Buea Chapter.**
I helped organize orientations for incoming freshmen among other activities, and was the liaison between students and the department.

AWARDS, FELLOWSHIPS & HONORS

- 2011 **Student-Athlete Outstanding Mentor of the Year.** Athletic Department, Utah State University.
- 2011 **Utah State Graduate Researcher of the Year.** Robins Award, Utah State University
- 2011 **Graduate Researcher of the Year.** College of Humanities and Social Sciences. Utah State University.
- 2011 **Graduate Research Assistant of the Year.** Department of Sociology, Social Work and Anthropology. Utah State University
- 2010-2011 Dr. Dinesh and Kalpana Patel Doctoral Graduate Fellowship

- 2010 Third Place in College of Humanities, Arts, Social Sciences
Division of presentations for “Socioeconomic Status and HIV: Do the
Mechanisms that put Females in Cameroon at Increased Risk differ by
SES?” Intermountain West Graduate Research Symposium.
- 2009 Graduate Student Senate Travel Award
- 2009 Stipend Enhancement Award, Utah State University, Graduate Student
Senate
- 2008 Cameroon Ministry of Higher Education Scholarship
- 2007 Union for African Population Studies International Travel Award
- 2007 Women and Gender Research Institute Travel Award
- 2007 Graduate Student Senate Travel Award
- 2006-2011 Full Doctoral-Level Assistantship, Dept. of Sociology, Utah State
University.
- 2006-2009 Calvin R. Maurer Fellowship, College of Humanities, Arts and Social
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- 2005 Elected into Who’s Who among Students in American Universities
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